

Trouble-shooting instructions : ALL-5000

BOSCH system : Alarm system 20c, 20s

Make of vehicle : General

Basic microcard : KFZ-00..

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SPECIAL FEATURES

This microcard, valid at the time of publication, contains trouble-shooting instructions for the following alarm system:

Auto Alarm 20c, 20s with trigger boxes
0 335 411 031, 033 also in combination with:

- * Auto Alarm Plus 3 (wheel protection)
- * Auto Alarm Plus 4 (passenger-compartment protection)
- * Priming indicator (LED)

IMPORTANT:
Leads of ultrasonic sensor and anti-tow safeguard must not be extended and must not be laid in parallel.

STRUCTURE, USAGE

These brief instructions essentially comprise vehicle-specific special features and test specifications (set values).

In line with the customer complaint, the trouble-shooting chart leads to various causes/component faults.
A detailed description of trouble-shooting is given in the trouble-shooting chart in the basic instructions.
NOTE: Even if reference is made to basic instructions, the set values, terminal assignments and special features indicated in these vehicle-specific brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

As a general rule alarm systems are maintenance-free. Attention must be paid to the following when working on vehicles with an alarm system fitted.

- * Detach plug of electronic trigger box when carrying out welding work using electric welding equipment.
- * When performing painting work, the electronic trigger box may be subjected to max. + 95° C for brief periods and max. +85° C for long periods (approx. 2 hours).
- * Make sure battery terminals are properly tightened at terminal posts of battery.
- * Do not use a fast charger to start engine.
- * Never disconnect battery from vehicle electrical system with engine running.
- * Detach battery from vehicle electrical system when carrying out fast charging.
- * Do not detach or attach wiring-harness plugs of trigger boxes with ignition switched on.

TEST PREREQUISITES

- * Alarm system installed as per installation instructions.
- * All plug contacts O.K.
- * Spring contacts in plugs engaged.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

The fault characteristics outlined below may be due to one or more faults.

1. False alarm with Auto Alarm 20c, 20s following installation with system primed		
2. False alarm with Auto Alarm 20c, 20s after system has already been functioning properly for some time.		
3. No alarm with Auto Alarm 20c, 20s. Alarm system 20c primed by way of encoding switch or 20s by way of key-operated switch		
Cause (component fault)		
X		Circuit fault on installation of system, door contacts must not be connected to S- and S1-
X		Contact switches of hood and trunk lid are not connected to S- and S1-
X	X	Positive or negative fan motor incorrectly connected
	X	Loose contact in ground lead of load routed via terminal E of alarm relay
	X	Short circuit or short to ground between leads
	X	Contact switch, leads or fuse defective
	X	Interior lamp on: power supply of alarm relay interrupted; alarm relay, alarm relay, encoding switch, key-operated switch or alarm horn defective.

TROUBLE-SHOOTING CHART (CONTINUATION 1)

Customer complaint (fault symptoms)

The fault characteristics indicated below may be caused by one or more faults.

4. No alarm in the case of Auto Alarm 20c, 20s, alarm system 20c primed with encoding switch or 20s with key-operated switch.
5. No alarm in the case of Auto Alarm 20c and 20s with additional Auto Alarm Plus 3 (wheel protection). Alarm system primed.
6. No alarm in the case of Auto Alarm 20c and 20s with additional Auto Alarm Plus 4 (passenger compartment protection). Alarm system primed.
7. Sudden alarm in the case of Auto Alarm 20c or 20s with Auto Alarm Plus 4 and auxiliary heating.

Cause (Component fault)

X			If engine compartment or trunk lighting O.K., fault is to be found in alarm relay or lead
X			Short circuit or short to ground in contact switch or lead to connected load
X			Plug connections dropped off at alarm relay or angle encoder
X			Encoding switch, key-operated switch, wheel protection or angle encoder defective
	X		Encoding switch, key-operated switch or ultrasonic detector defective
		X	Movement of air in passenger compartment due to start-up of auxiliary heating

TROUBLE-SHOOTING CHART (CONTINUATION 2)

Customer complaint (fault symptoms)

The fault characteristics indicated below may be caused by one or more faults.

8. Auto Alarm System 20c cannot be primed with encoding switch or cannot be switched off during alarm situation.
9. Auto Alarm System 20s cannot be primed with key-operated switch or cannot be switched off during alarm situation.
10. Sudden alarm in the case of Auto Alarm 20c or 20s without Alarm Plus 4 and auxiliary heating.

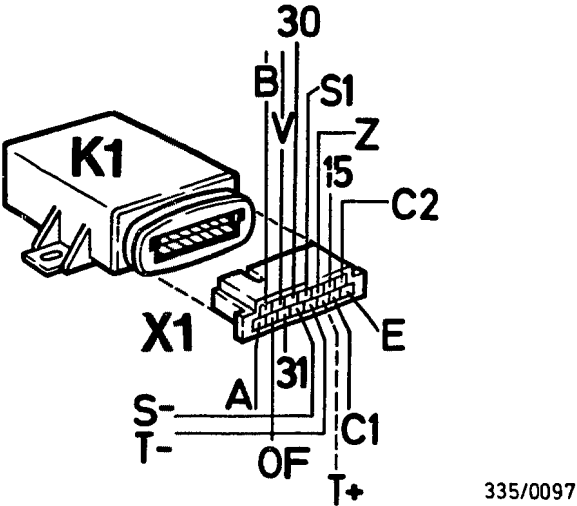
Cause (component fault)

X			Encoding switch defective or open circuit in leads
	X		Key-operated switch defective
		X	Run-out of heating-blower motor acts as generator. Trigger box detects voltage via term. 15 and triggers alarm.
X	X	X	Alarm relay defective

RAPID DIAGNOSIS CHART

Component installed in vehicle (trigger box 0 335 411 031, 033)

Test step	Testing of component / function Test instructions/conditions	Term.	Set values
1	Supply voltage term. 30, ignition off, vehicle stopped	30	greater than/ equal to 10 V
2	Supply voltage term. 15, ignition on, vehicle stopped	15	greater than/ equal to 10 V
3	Supply voltage, relay contact for alarm horn actuation	B	greater than/ equal to 10 V
4	Ignition off. Prime system with encoding switch or key-operated switch. If auxiliary units such as "Plus 3 or Plus 4" are connected (voltage measurement). With trigger box 0 335 411 033 If auxiliary units not connected (resistance measurement).	Z	primed < 2.7 V deprimed > 10 V primed < 2.0 V primed < 1 k Ω deprimed > 1 M Ω
5	AS primed: door closed door open Alarm must sound immediately on opening door.	T+	approx. 0 V greater than/ equal to 10 V
6	AS primed: door closed door open Alarm must sound immediately on opening door.	T-	greater than/ equal to 10 V approx. 0 V
7	AS primed: trunk lid closed open trunk lid Alarm must sound immediately on opening.	S-	greater than / equal to 10 V approx. 0 V



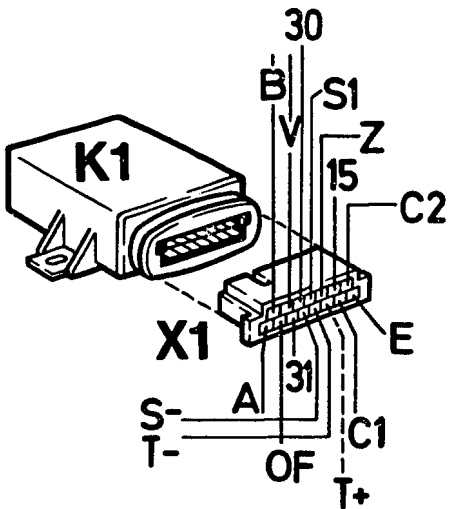
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
B = Fuses, term. 30
C1 = Alarm delay 5...8s
C2 = Alarm delay 10...14s
E = Encoding switch or key-operated switch
OF = not used
S- = Trunk switch
S1- = Engine compartment switch
T+ = Door contact switch positive switching
T- = Door contact switch negative switching
V = Relay K2, term. 85
Z = not used
15 = Ignition/starting switch S2, term. 15
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 1)

Component installed in vehicle (J 335 411 031, 033)

Test step	Testing of component / function Test instructions/conditions	Term.	Set values
8	AS primed: hood closed open hood Alarm must sound immediately on opening.	S1-	greater than/ equal to 10 V approx. 0 V
9	If no relay is externally connected (resistance measurement) If relay is externally connected (voltage measurement)	V	primed > 1 M Ω deprimed approx. 0 Ω primed > 10 V deprimed < 2.7 V
10	Irrespective of whether AS is primed or de-primed, detach electrical connection at E or short-circuit. It must only be possible to switch alarm off again with encoding switch or key-operated switch.	E	Alarm must sound immediately
11	AS primed, trigger alarm by opening door Use analog multimeter	A	less than 6 V greater than 10 V intermittent
12	AS primed, trigger alarm by opening door Use analog multimeter with relay	OF	less than 6 V greater than 10 V intermittent
13	Ground connection from alarm relay to vehicle ground	31	approx. 0 Ω
14	Ground connection from alarm relay to vehicle ground, if present	C1	approx. 0 Ω
15	Ground connection from alarm relay to vehicle ground, if present	C1	approx. 0 Ω



K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
B = Fuses, term. 30
C1 = Alarm delay 5...8s
C2 = Alarm delay 10 ... 14s
E = Encoding switch or key-operated switch
OF = not used
S- = Trunk switch
S1- = Engine compartment switch
T+ = Door contact switch positive switching
T- = Door contact switch negative switching
V = Relay K2, term. 85
Z = not used
15 = Ignition/starting switch S2, term. 15
30 = Fuses, term. 30
31 = Vehicle ground

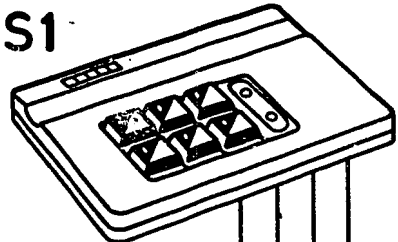
Rapid diagnosis chart

Encoding switch 0 986 333 012 only in conjunction with alarm relay 0 335 411 031, 033 installed in vehicle

Test step	Testing of component / function Test instructions/conditions	Term.	Set values
1	Supply voltage, encoding switch (red) Ignition off.	30	greater than/ equal to 10 V
2	Ground connection, encoding switch (brown)	31	approx. 0 Ω
3	Signal line to encoding switch (yellow) Measure with analog multimeter Prime AS, LED flashes for approx. 3 s. Deprime AS, LED lights up for approx. 3 s.	E	approx. 3...4V approx. 6 V
4	Priming interlock (green) With voltage applied to D+, it must no longer be possible to prime alarm system. AS deprimed	D+	greater than 2.5 V

Key-operated switch 0 342 006 006 in conjunction with alarm relay 0 335 411 031, 033 installed in vehicle

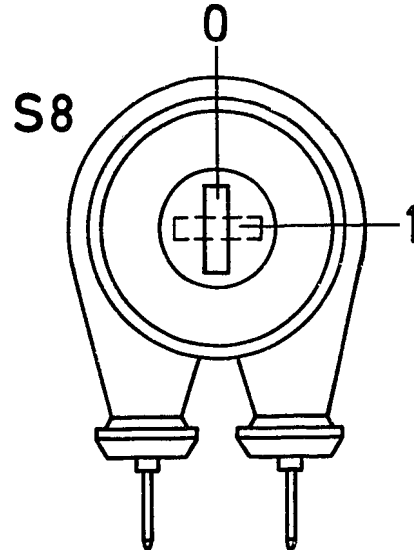
Test step	Testing of component / function Test instructions/conditions	Term.	Set values
1	Mechanically move key-operated switch: AS deprimed AS primed	E	2.4 k Ω 4.8 K Ω



(1) rt (4)gn
(3)ge (2)br 335/0109

S1 = Encoding switch
Connections:
1 = red lead to term. 30
2 = brown lead to ground
3 = yellow lead to alarm
relay, term. E
4 = green lead to term. 15

S8 = Key-operated switch
0 = AS deprimed
1 = AS primed



335/0110

TEST SPECIFICATIONS

Auto Alarm 20c

* Battery voltage		10...13 V
* Priming delay		25...45 s
* Alarm time	audio	25...30 s
	visual	less than 4 min.
* Response time	option of	5... 8 s
		10...14 s

Auto Alarm 20s

* Battery voltage		10...13 V
* Priming delay		25...45 s
* Alarm time	audio	25...30 s
	visual	less than 4 min.
* Response time	option of	5... 8 s
		10...14 s

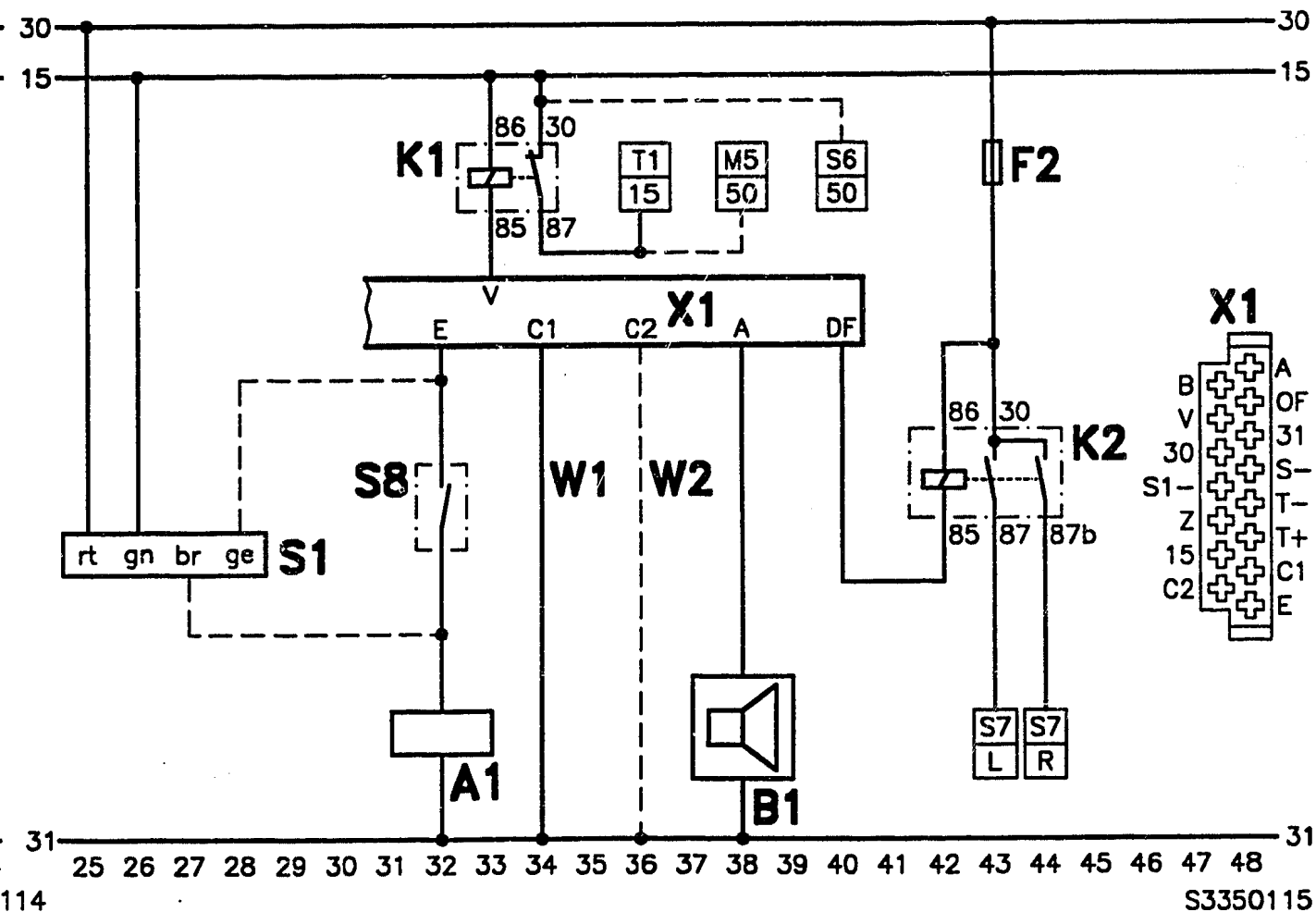
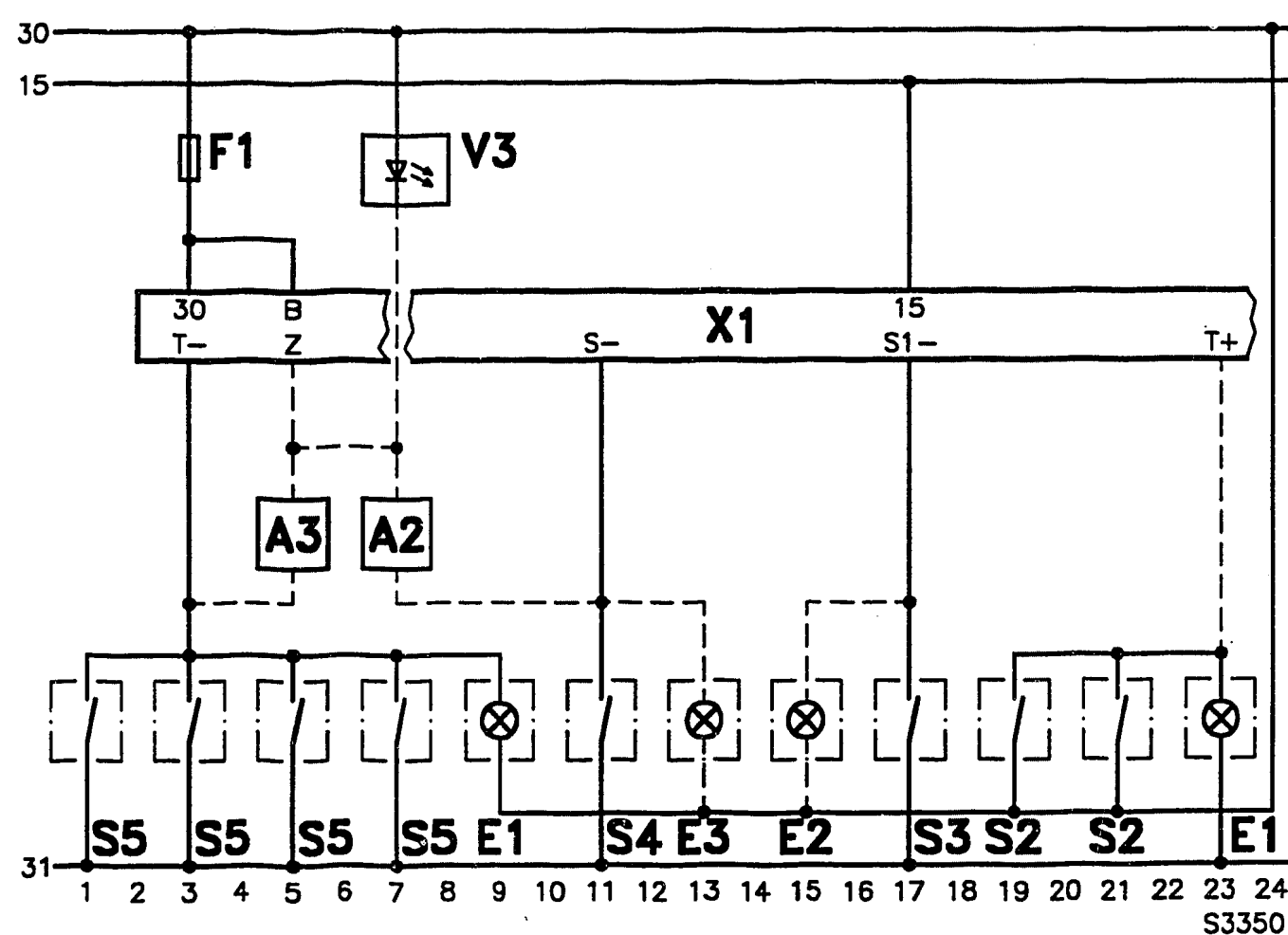
Auto Alarm Plus 3

* Battery voltage	9...13 V
* Adjustment time of angle encoder	approx. 45...55 s
* Response time	approx. 1... 2 s

For production reasons:
continued on the following
coordinate.

Auto Alarm Plus 4

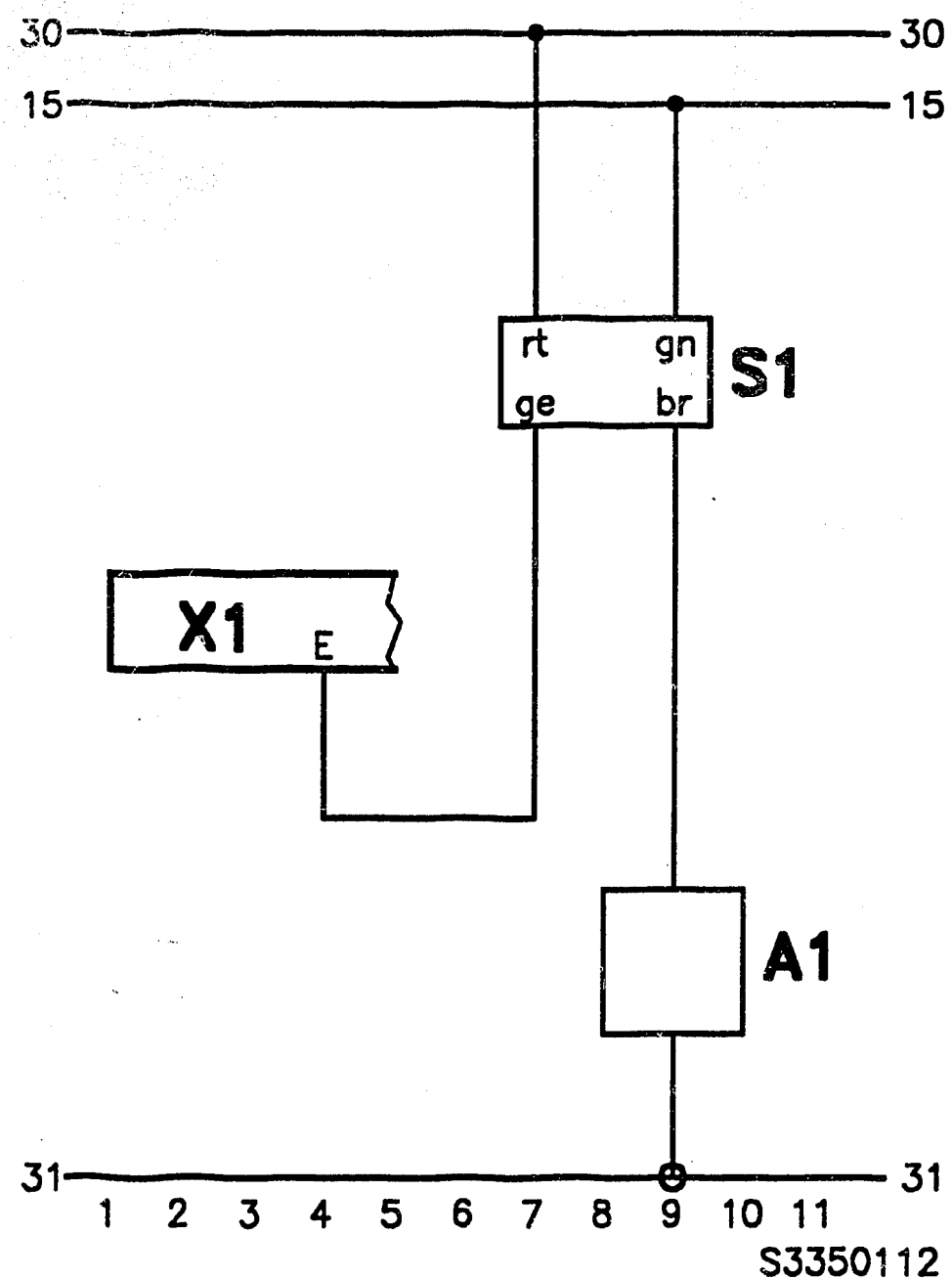
* Battery voltage			10...13 V
* Priming delay			25...45 s
* Alarm time	audio		25...30 s
	visual	less than	4 min.
* Response time option of			6...10 s
or			11...16 s



ELECTRICAL TERMINAL DIAGRAM

A1 = Car radio	K2 = Relay for visual alarm
A2 = Auto Alarm "Plus 3"	M5 = Starting motor
A3 = Auto Alarm "Plus 4"	S1 = Encoding switch
B1 = Alarm horn	S2 = Door contact switch, positive switching
E1 = Interior lamp, front	S3 = Engine compartment switch
E2 = Engine compartm. light	S4 = Trunk switch
E3 = Trunk light	S5 = Door contact switch, negative switching
F1, F2 = Fuses 8A	S6 = Ignition/starting switch
K1 = Relay for ignition/starting disable	

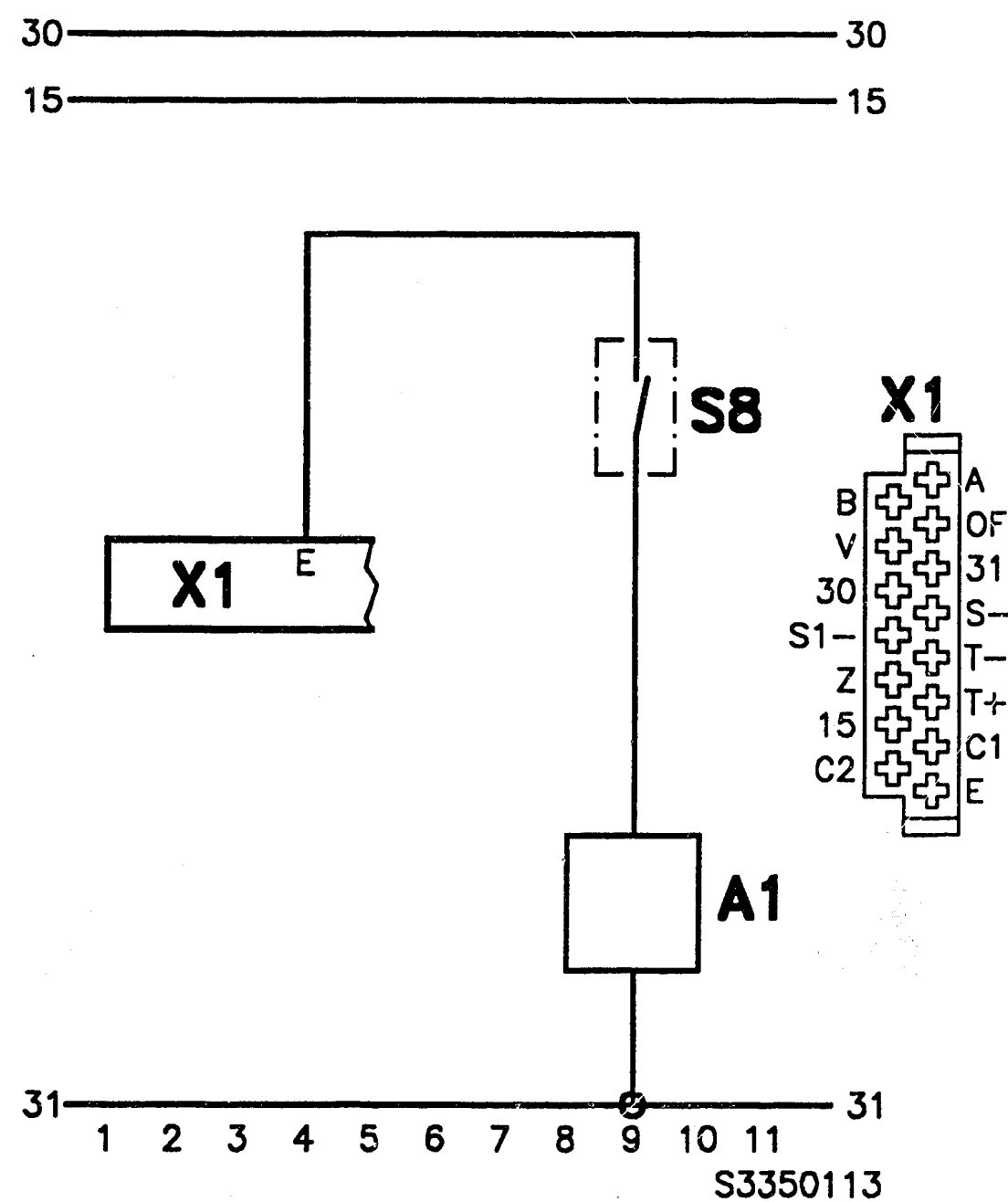
S7 = Turn-signal switch	
S8 = Key-operated switch	
T1 = Ignition coil	
V3 = Priming indicator LED	
W1 = Encoding lead 1 (5...8 s)	
W2 = Encoding lead 2 (10...14 s)	
X1 = Plug, alarm relay	
br = brown	gn = green
ge = yellow	rt = red



BASIC CIRCUIT FOR ENCODING SWITCH

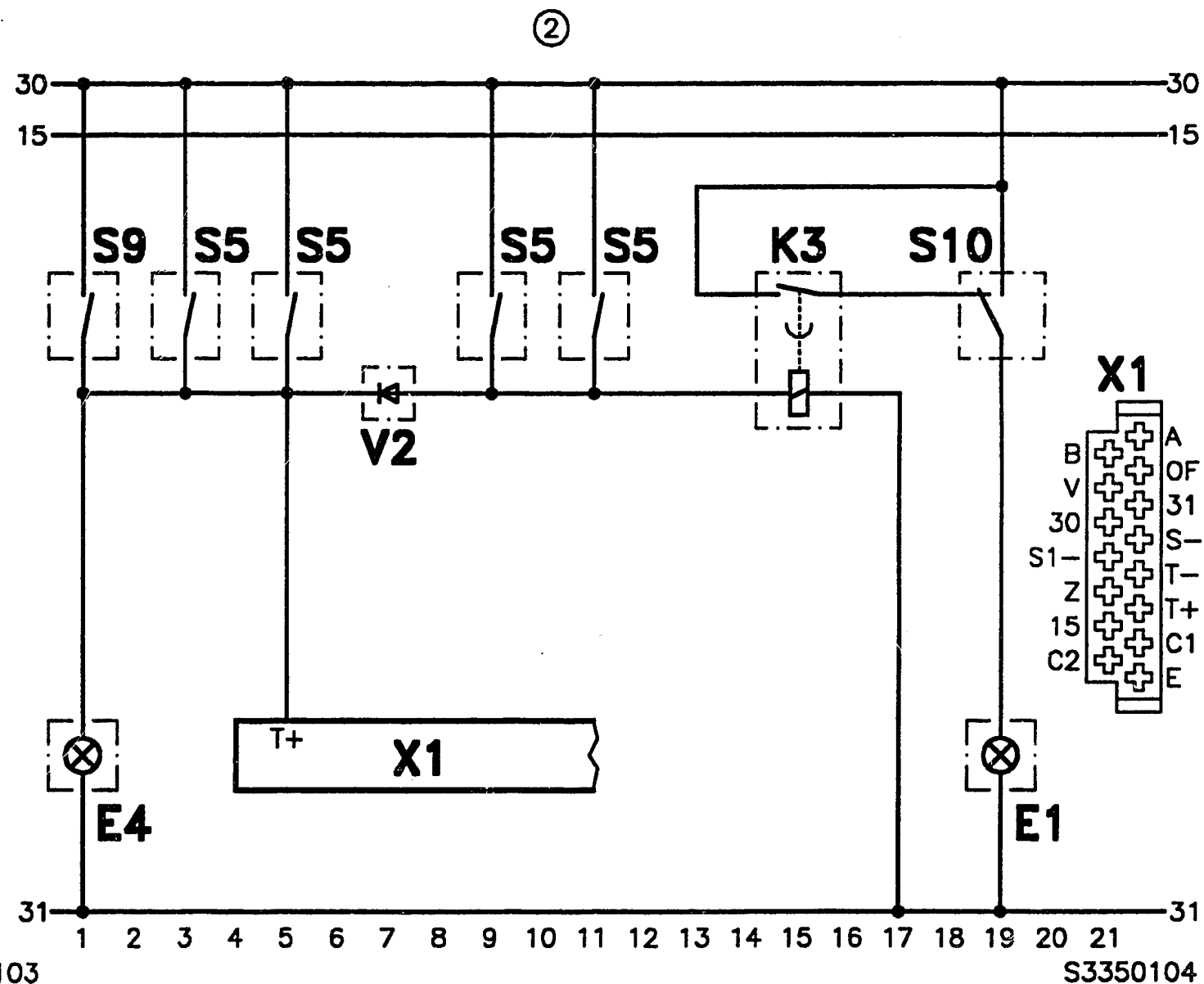
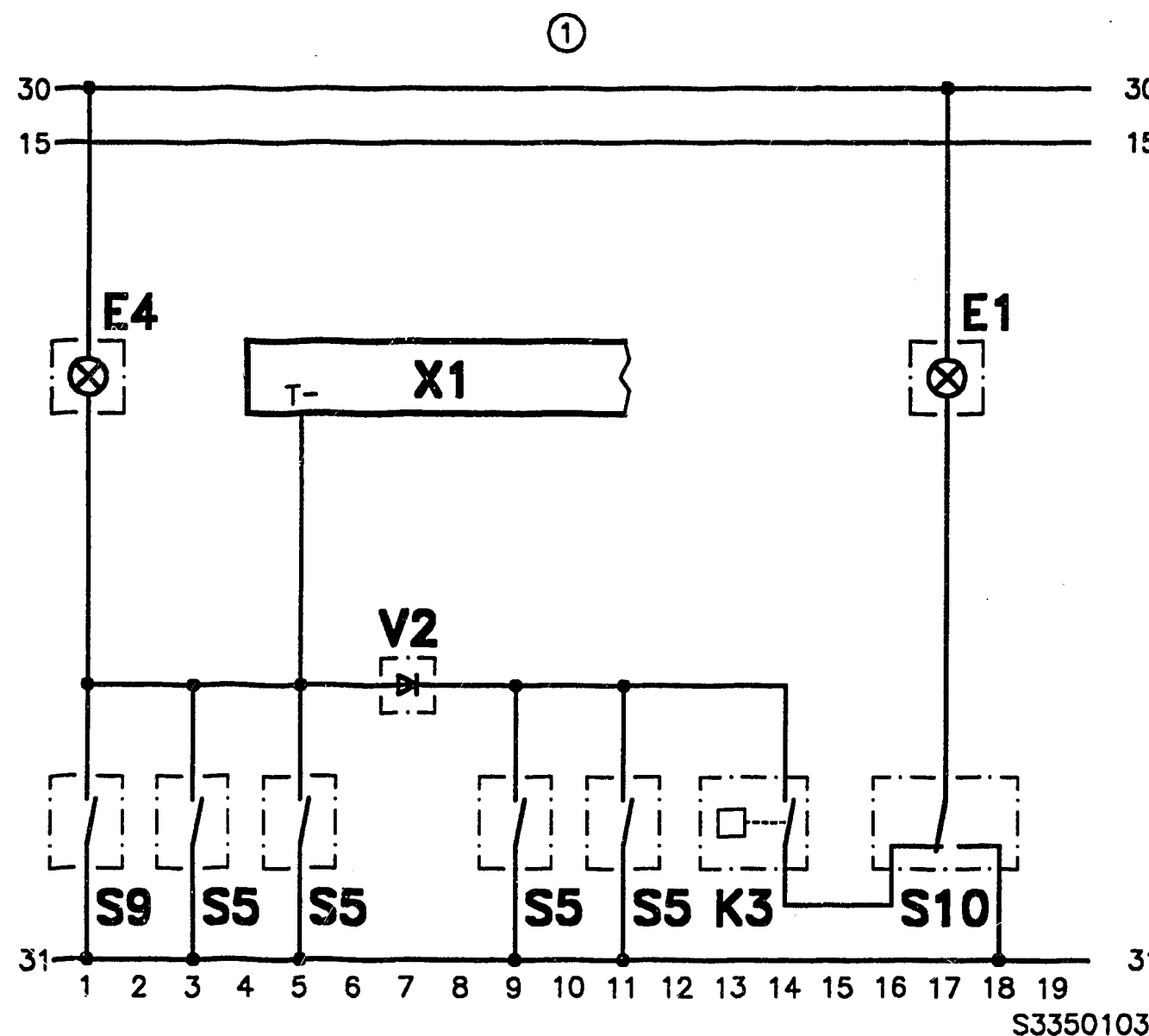
A1 = Car radio
S1 = Encoding switch
X1 = Plug, alarm relay

rt = red
br = brown
ge = yellow
gn = green



BASIC CIRCUIT FOR KEY-OPERATED SWITCH

A1 = Car radio
S8 = Key-operated switch
X1 = Plug, alarm relay



SPECIAL CIRCUITS FOR REAR INTERIOR LAMP

1 = Door contact switch, neg. switching

2 = Door contact switch, pos. switching

E1 = Interior lamp, front

E4 = Interior lamp, rear

K3 = Time-lag relay

S5 = Door contact switch

S9 = Switch for interior lamp, rear

S10 = Switch in interior lamp, front

V2 = Blocking diode

X1 = Plug, alarm relay

INSTALLATION POSITION OF COMPONENTS

- * Install alarm relay in passenger compartment at arbitrary location (e.g. beneath instrument panel) with connections downwards.
- * Attach encoding switch in passenger compartment at arbitrary location offering ease of access.
- * Priming indicator (LED) at readily visible location in passenger compartment.
- * Key-operated switch can be fitted by means of selectable time delay to alarm relay in interior of vehicle or at arbitrary location on outside of vehicle.
- * Ultrasonic sensor in passenger compartment. Above rear-view mirror or in centre of instrument panel.
- * Anti-tow safeguard in passenger compartment or trunk.

For production reasons:
continued on the following
coordinate.

Trouble-shooting instructions : ALL-5001

BOSCH system : Alarm system 201

Make of vehicle : General

Basic microcard : KFZ-00..

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SPECIAL FEATURES

This microcard, valid at the time of publication, contains trouble-shooting instructions for the following alarm system:

Auto Alarm 201 0 335 411 9.. with trigger box
0 335 411 031, 033 and evaluation electronics
1 987 335 007 also in combination with:

- * Auto Alarm Plus 3 (wheel protection)
- * Auto Alarm Plus 4 (passenger compartment protection)
- * Central-locking module
- * Priming indicator (LED) only with trigger box
0 335 411 033

IMPORTANT:
Leads of ultrasonic sensor, anti-tow safeguard and infrared pre-amplifier must not be extended and must not be laid in parallel.

STRUCTURE, USAGE

These brief instructions essentially comprise vehicle-specific special features and test specifications (set values).

In line with the customer complaint, the trouble-shooting chart leads to various causes/component faults.
A detailed description of trouble-shooting is given in the trouble-shooting chart in the basic instructions.
NOTE: Even if reference is made to basic instructions, the set values, terminal assignments and special features indicated in these vehicle-specific brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

As a general rule alarm systems are maintenance-free. Attention must be paid to the following when working on vehicles with an alarm system fitted.

- * Detach plug of electronic trigger box when carrying out welding work using electric welding equipment.
- * When performing painting work, the electronic trigger box may be subjected to max. + 95° C for brief periods and max. +85° C for long periods (approx. 2 hours).
- * Make sure battery terminals are properly tightened at terminal posts of battery.
- * Do not use a fast charger to start engine.
- * Never disconnect battery from vehicle electrical system with engine running.
- * Detach battery from vehicle electrical system when carrying out fast charging.
- * Do not detach or attach wiring-harness plugs of trigger boxes with ignition switched on.

TEST PREREQUISITES

- * Alarm system installed as per installation instructions.
- * All plug contacts O.K.
- * Spring contacts in plugs engaged.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

The fault characteristics outlined below may be due to one or more faults.

1. False alarm with Auto Alarm 201 following installation with system primed.		
2. False alarm with Auto Alarm 201 after system has already been functioning properly for some time.		
3. No alarm with Auto Alarm 201, alarm system primed by way of infrared key.		
Cause (component fault)		
X		Circuit fault on installation of system, door contacts must not be connected to S- and S1-
X		Contact switches of hood and trunk lid are not connected to S- and S1-
X	X	Positive or negative fan motor incorrectly connected
	X	Loose contact in ground lead of load routed via terminal E of alarm relay
	X	Short circuit or short to ground between leads
	X	Switch, leads or fuse defective
	X	Interior lamp on: power supply of alarm relay interrupted; alarm relay, evaluation electronics or alarm horn defective

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

The fault characteristics indicated below may be caused by one or more faults.

		4. No alarm in the case of Auto Alarm 20i, alarm system primed via infrared key.
		5. No alarm in the case of Auto Alarm 20i with additional Auto Alarm Plus 3 (wheel protection). Alarm system primed.
		6. No alarm in the case of Auto Alarm 20i with additional Auto Alarm Plus 4 (passenger compartment protection). Alarm system primed.
		7. Sudden alarm in the case of Auto Alarm 20i with Auto Alarm Plus 4 and auxiliary heating.
		Cause (Component fault)
X		If engine compartment or trunk lighting O.K., fault is to be found in alarm relay or lead
X		Short circuit or short to ground in switch or lead to connected load
X		Plug connections dropped off at alarm relay or angle encoder
X		Evaluation electronics, wheel protection or angle encoder defective
	X	Evaluation electronics or ultrasonic detector defective
	X	Movement of air in passenger compartment due to start-up of auxiliary heating

TROUBLE-SHOOTING CHART (CONTINUED)

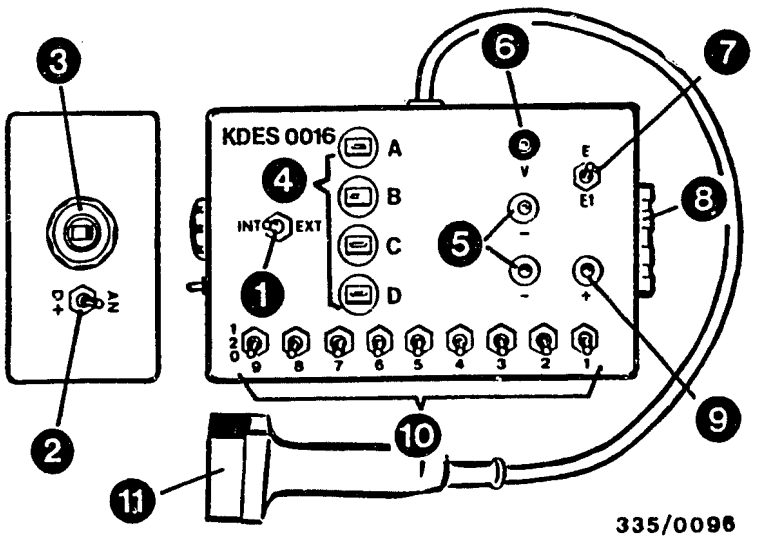
Customer complaint (fault symptoms)

The fault characteristics outlined below may be due to one or more faults:

		8. Restricted range of infrared key in the case of Auto Alarm 20i.
		9. Auto Alarm system 20i cannot be primed with infrared key or cannot be switched off during alarm situation.
		10. Sudden alarm in the case of Auto Alarm 20i without Alarm Plus 4 and auxiliary heating.
		Cause (component fault)
X		Batteries in infrared key defective or weak
	X	Infrared evaluation electronics defective
	X	Run-out of heating-blower motor acts as generator. Trigger box detects voltage via term. 15 and triggers alarm.
X	X	Pre-amplifier (infrared receiver) defective
	X	Voltage at term. D+ has no definitive ground potential with ignition off.

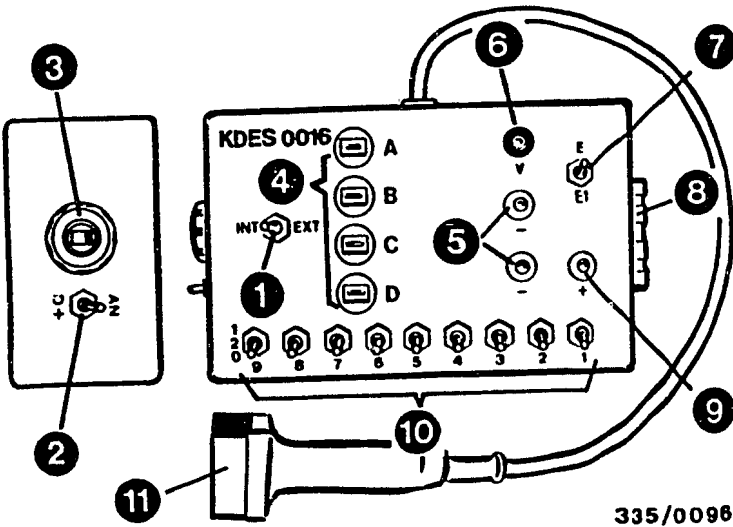
RAPID DIAGNOSIS CHART FOR ALARM-SYSTEM TESTER KDES 0016

Test step	Testing of component/function	Additional operation	Test conditions/ test instructions/ possible causes of trouble	Set values
1	Hand trans-mitter	Set encoding switch, item 10 to code of hand transmitter to be tested.	* Plug, item 11 connected to tester. * Switch 2 set to D+ * Switch 1 set to int. * Switch 7 set to E	
	Priming and depriming of alarm system.	Apply voltage of approx. 12 V. Item 9 (+) Item 5 (-)	For testing the hand transmitter, use is made of the built-in components in the tester (infrared pre-amplifier and evaluation electronics).	
	Priming	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly	LED in infrared pre-amplifier flashes for approx. 3 s
	Depriming	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly * Hand transmitter defective * BA in hand transmitter too weak * Tester KDES 0016 defective	LED in infrared pre-amplifier lights up constantly for approx. 3 s



- 1 = Changeover switch for infrared pre-amplifier (internal/external)
 - 2 = Nonlocking switch D+/AN
 - 3 = Infrared pre-amplifier installed.
 - 4 = Flat-contact sockets for external infrared pre-amplifier.
 - 5 = Ground sockets
 - 6 = Measurement output
 - 7 = Changeover switch E/E1
 - 8 = Evaluation electronics installed.
 - 9 = Socket for voltage supply (+)
 - 10 = Encoding switch 1 ... 9
 - 11 = Plug for evaluation electronics
- A for red lead (+)
B for black lead
C for grey lead
D for brown lead (-)
of infrared pre-amplifier, external.

Test step	Testing of component/function	Additional operation	Test conditions/ test instructions/ possible causes of trouble	Set values
2	Evaluation electronics	Use hand transmitter with same coding as evaluation electronics for testing.	Evaluation electronics 1 987 335 007 removed * Detach plug for evaluation electronics, item 11 from tester and attach it to evaluation electronics 1 987 335 007 to be tested. * Switch, item 2 set to D+ * Switch, item 1 set to int. * Switch, item 7 set to E	
	Priming and depriming of alarm system.	Apply voltage of approx. 12 V. Item 9 (+) Item 5 (-)	To test evaluation electronics, use is made of the built-in infrared pre-amplifier in the tester and the appropriate hand transmitter for the evaluation electronics.	
	Priming	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly	LED in infrared pre-amplifier flashes for approx. 3 s
	Depriming	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly * Hand transmitter defective * Evaluation electronics def. * Tester KDES 0016 defective	LED in infrared pre-amplifier lights up constantly for approx. 3 s

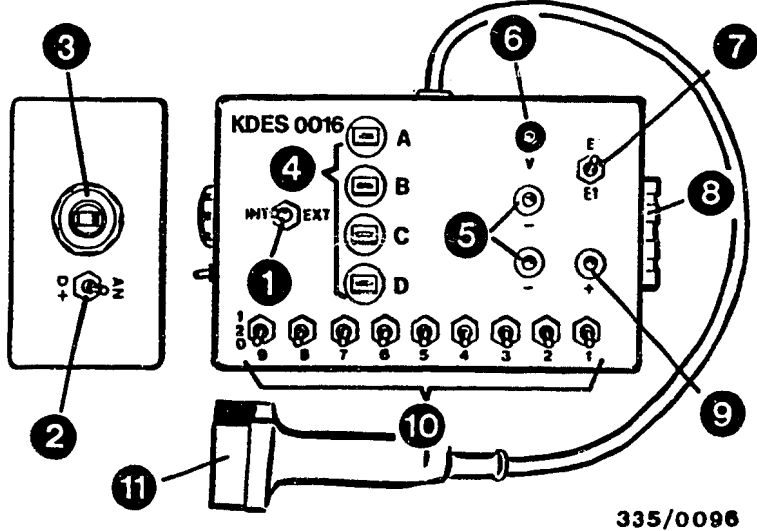


- 1 = Changeover switch for infrared pre-amplifier (internal/external)
- 2 = Nonlocking switch D+/AN
- 3 = Infrared pre-amplifier installed.
- 4 = Flat-contact sockets for external infrared pre-amplifier.
- 5 = Ground sockets
- 6 = Measurement output
- 7 = Changeover switch E/E1
- 8 = Evaluation electronics installed.
- 9 = Socket for voltage supply (+)
- 10 = Encoding switch 1 ... 9
- 11 = Plug for evaluation electronics

A for red lead (+)
B for black lead
C for grey lead
D for brown lead (-)
of infrared pre-amplifier, external.

RAPID DIAGNOSIS CHART FOR ALARM-SYSTEM TESTER KDES 0016 (CONTINUED)

Test step	Testing of component/function	Additional operation	Test conditions/ test instructions/ possible causes of trouble	Set values
3	Infrared pre-amplifier	Use hand transmitter with same encoding as evaluation electronics for testing.	Infrared pre-amplifier 1 987 335 010 removed * Plug, item 11 connected to tester. * Switch, item 2 set to D+ * Switch, item 1 set to ext. * Switch, item 7 set to E * Connect ext. infrared pre-amplifier to tester: red lead to A black lead to B green lead to C brown lead to D	
	Priming and depriming of alarm system	Apply voltage of approx. 12 V. Item 9 (+) Item 5 (-)	To test infrared pre-amplifier, use is made of built-in evaluation electronics in tester and an arbitrary hand transmitter. The code of the hand transmitter must be set on the tester with the encoding switches, item 10.	
	Priming	Direct hand transmitter towards infrared pre-amplif. and press button on hand transmitter	LED in hand transmitter must light up brightly	LED in infrared pre-amplifier flashes for approx. 3 s
	Depriming	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly * Evaluation electronics in tester incorrectly coded * Hand transmitter defective * Infrared pre-amplifier defective * Tester KDES 0016 defective	LED in infrared pre-amplifier lights up constantly for approx. 3 s



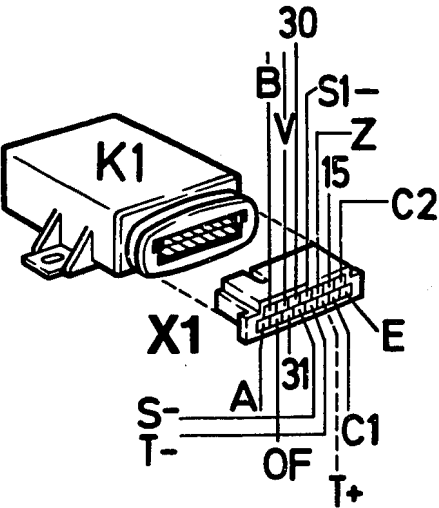
- 335/0096
- 1 = Changeover switch for infrared pre-amplifier (internal/external)
 - 2 = Nonlocking switch D+/AN
 - 3 = Infrared pre-amplifier installed.
 - 4 = Flat-contact sockets for external infrared pre-amplifier.
 - 5 = Ground sockets
 - 6 = Measurement output
 - 7 = Changeover switch E/E1
 - 8 = Evaluation electronics installed.
 - 9 = Socket for voltage supply (+)
 - 10 = Encoding switch 1 ... 9
 - 11 = Plug for evaluation electronics

A for red lead (+)
B for black lead
C for grey lead
D for brown lead (-)
of infrared pre-amplifier, external.

RAPID DIAGNOSIS CHART

Component installed in vehicle (trigger box 0 335 411 031, 033)

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
1	Supply voltage term. 30, ignition off, vehicle at a standstill	30	Greater than/equal to 10 V
2	Supply voltage term. 15, ignition on, vehicle at a standstill	15	Greater than/equal to 10 V
3	Supply voltage, relay contact for alarm horn actuation	B	Greater than/equal to 10 V
4	Ignition off. Activate system with infrared key. If additional equipment such as "Plus 3" or "Plus 4" is connected (voltage measurement). For trigger box 0 335 411 033 If additional equipment is not connected (resistance measurement).	Z	Active < 2.7 V Not active > 10 V Active < 2.0 Active 1 k Ω Not active 1 M Ω
5	AA active: Door closed Door open Alarm must sound immediately when door is opened.	T+	Approx. 0 V Greater than/equal to 10 V
6	AA active: Door closed Door open Alarm must sound immediately when door is opened.	T-	Greater than/equal to 10 V Approx. 0 V
7	AA active: Trunk lid closed Open trunk lid Alarm must sound immediately when opened.	S-	Greater than/equal to 10 V Approx. 0 V



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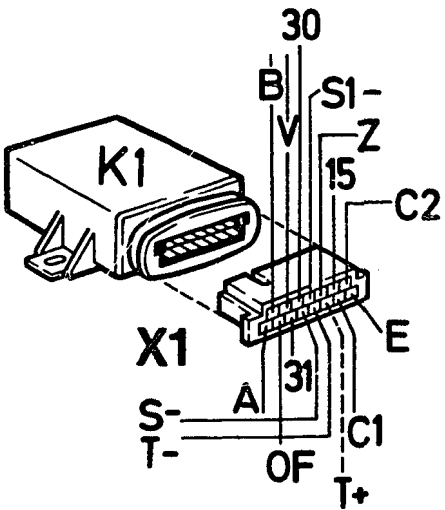
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
B = Fuses, term. 30
C1 = not used
C2 = not used
E = Evaluation electronics
OF = Relay K2, term. 85
S- = Trunk switch
S1- = Engine compartment switch
T+ = Door contact switch positive switching
T- = Door contact switch negative switching
V = Relay K2, term. 85
Z = Auxiliary units such as "Plus 3 or Plus 4"
15 = Ignition/starting switch S2, term. 15.
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 1)

Component installed in vehicle (0 335 411 031, 033)

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
8	AA active: Hood closed Open hood Alarm must sound immediately on opening.	S1-	Greater than/ equal to 10 V Approx. 0 V
9	If no relay is externally connected (Resistance measurement) If a relay is externally connected (Voltage measurement)	V	Active > 1 M Ω Not active approx. 0 Ω Active > 10 V Not active < 2.7 V
10	Irrespective of whether AA is active or not, detach electrical connection at E or short- circuit. It should only be possible to switch the alarm off again with the infrared key.	E	Alarm must sound immediately
11	AA active, trip alarm by opening door Use analog multimeter	A	Less than 6 V greater than 10 V, intermittent
12	AA active, trip alarm by opening door Use analog multimeter with relay	OF	Less than 6 V greater than 10 V, intermittent
13	Ground connection from alarm relay to vehicle ground	31	Approx. 0 Ω



335/0097

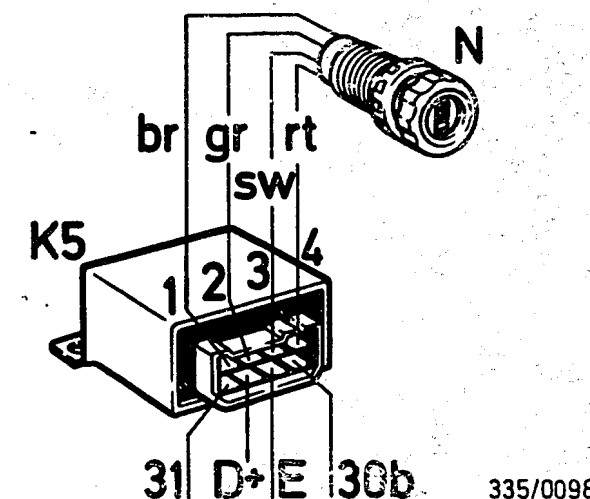
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
B = Fuses, term. 30
C1 = not used
C2 = not used
E = Evaluation electronics
OF = Relay K2, term. 85
S- = Trunk switch
S1- = Engine compartment switch
T+ = Door contact switch
positive switching
T- = Door contact switch
negative switching
V = Relay K2, term. 85
Z = Auxiliary units such
as "Plus 3 or Plus 4"
15 = Ignition/starting switch
S2, term. 15.
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 2)

Evaluation elect. 1 987 335 007 only in conjunction with alarm relay 0 335 411 031,
033 installed in vehicle

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
1	With voltage applied to D+ it should no longer be possible to activate AA AA not active	D+	Greater than 2.5 V
2	Irrespective of whether AA is active or not, briefly connect electrical connection at E to term. 31. Alarm must be given immediately and it should only be possible to switch the alarm off again using the infrared key. AA active AA not active	E	Approx. 1.3 V Approx. 2.1 V
3	Supply voltage, evaluation electronics Ignition off.	30b	Greater than/ equal to 10 V
4	Ground connection, evaluation electronics	31	Approx. 0 Ω
5	Ground connection, infrared receiver diode (brown)	1	Approx. 0 Ω
6	Signal line to infrared receiver diode (gray) Measure with analog multimeter Activate AA, LED flashes Deactivate AA, LED lights up	2	Approx. 3...4 V Approx. 6 V
7	Signal line from infrared receiver diode (black); measure with analog multimeter	3	Greater than 3 V less than 9 V, pulsating
8	Supply voltage, infrared receiver diode (red)	4	Greater than/ equal to 10 V



K5 = Evaluation electronics
N = Infrared pre-amplifier

Connections:

D+ = Ignition/starting switch or auxiliary relay, term. 30

E = Alarm relay

1 = brown lead to N

2 = grey lead to N

3 = black lead to N

4 = red lead to N

30b = Fuses, term. 30

31 = Vehicle ground or
car radio housing

TEST SPECIFICATIONS

Auto Alarm 201

* Battery voltage		10...13 V
* Activation delay		none
* Alarm time	audio	25...30 s.
	visual	less than 4 min.
* Response time		immediately

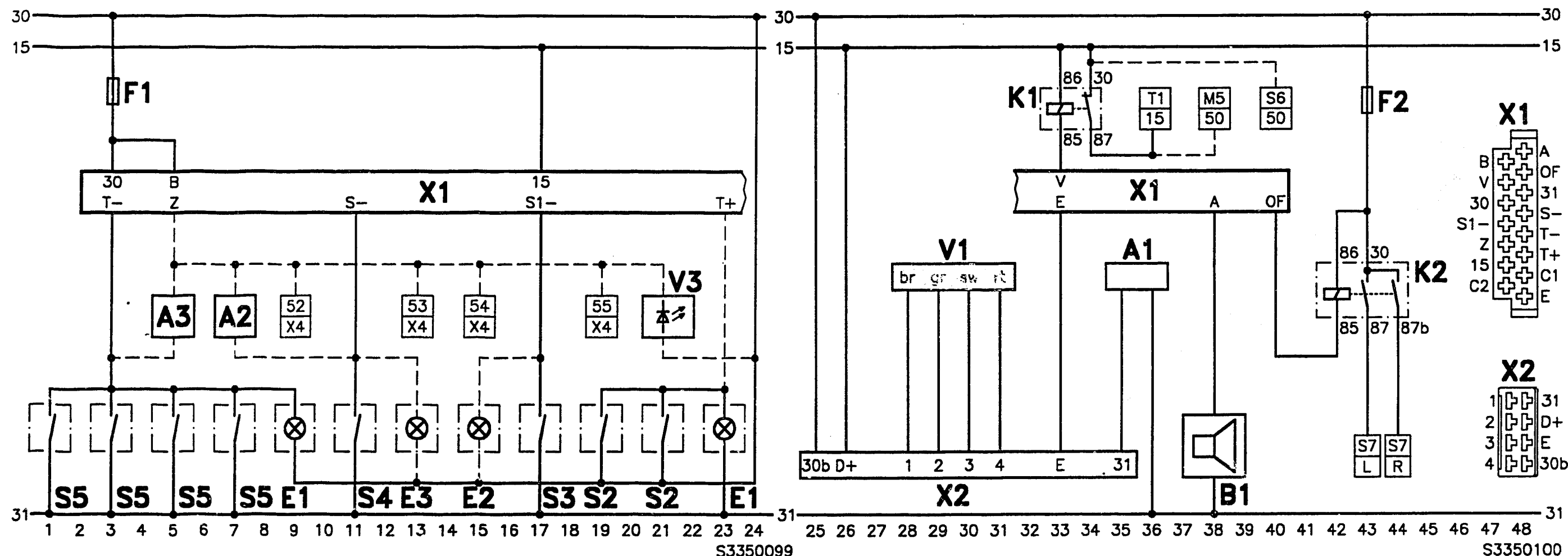
Auto Alarm Plus 3

* Battery voltage		9...13 V
* Adjustment time of angle encoder		approx. 45...55 s.
* Response time		approx. 1... 2 s.

Auto Alarm Plus 4

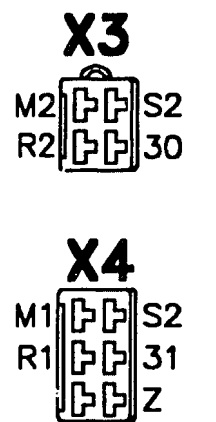
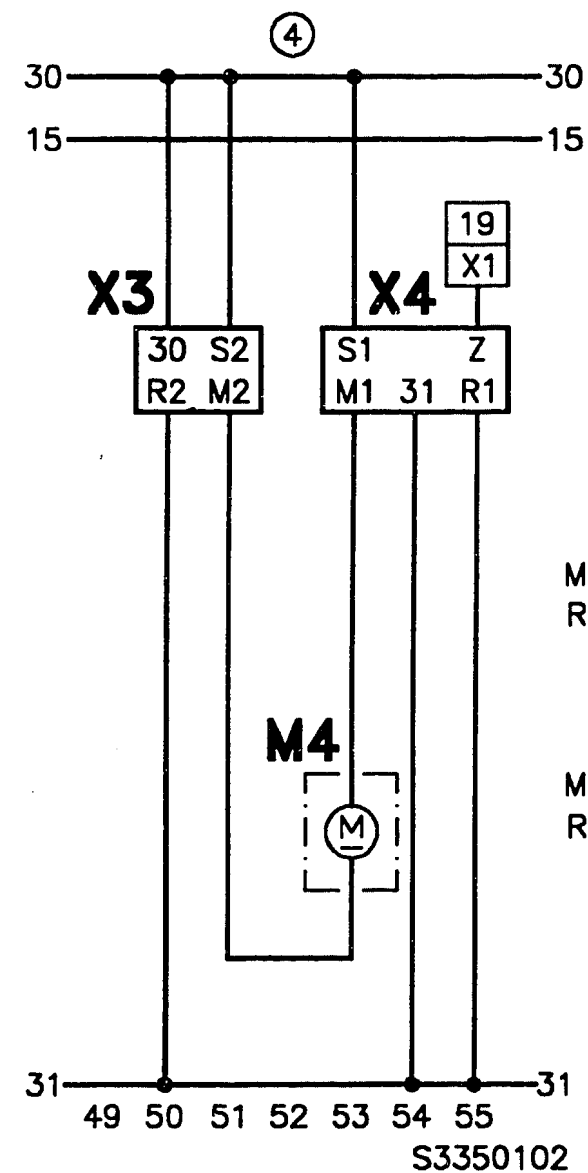
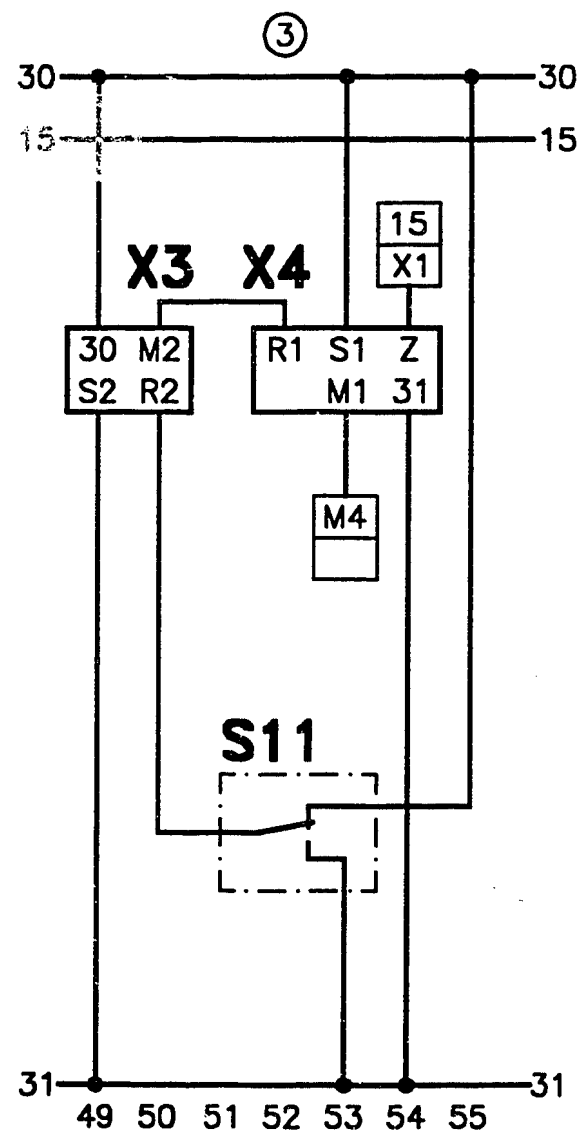
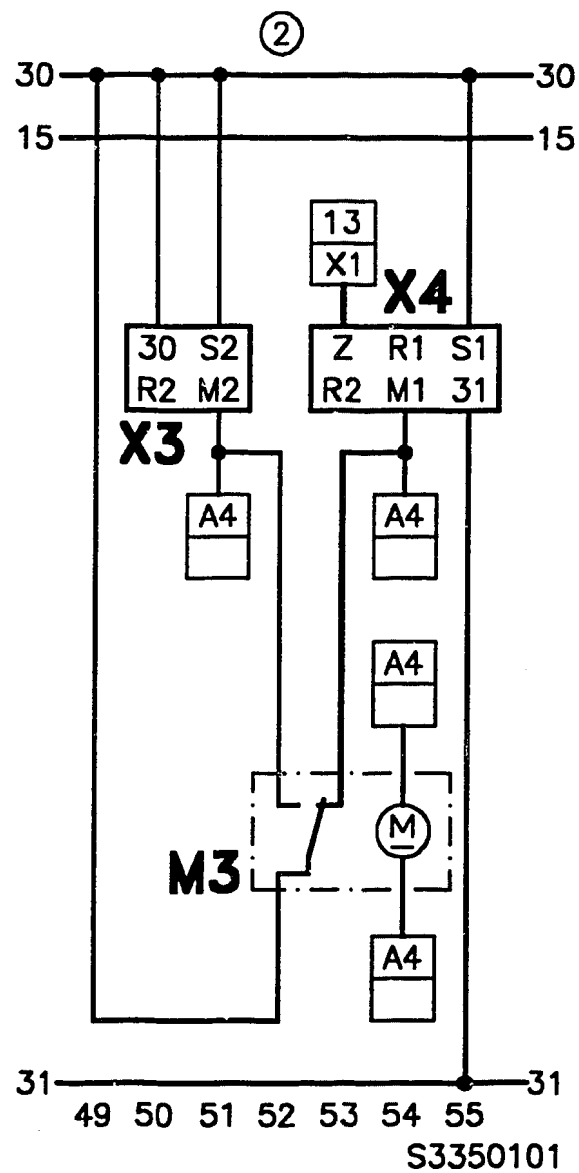
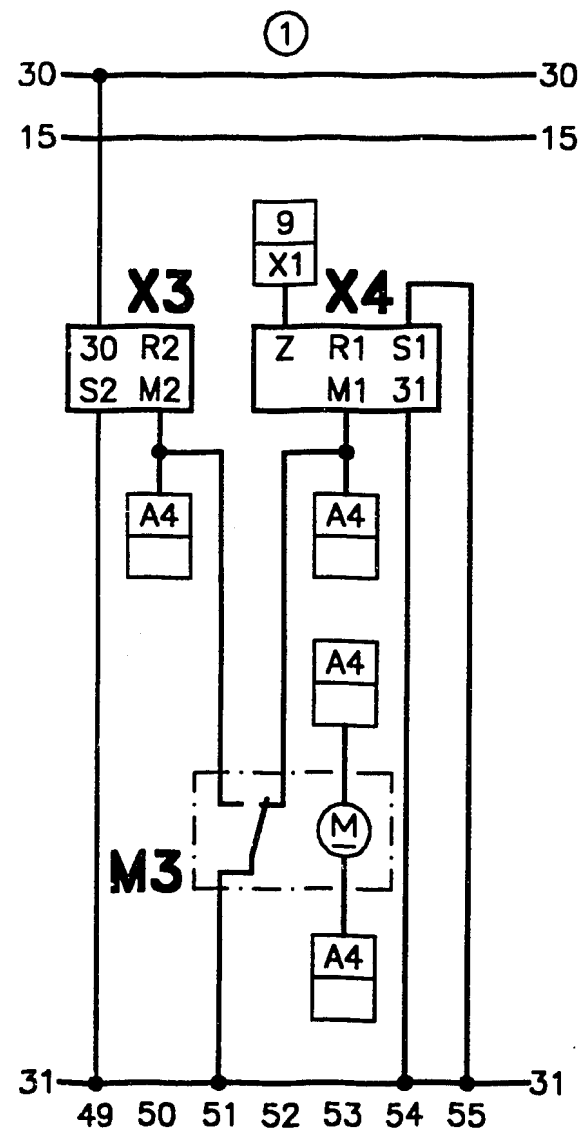
* Battery voltage		10...13 V
* Alarm time	audio	25...30 s.
	visual	less than 4 min.
* Response time		1...2 s.

For production reasons:
continued on the following
coordinate.



ELECTRICAL TERMINAL DIAGRAM

A1 = Car radio	K1 = Relay for ignition/starting inhibit	S7 = Turn-signal switch
A2 = Auto Alarm "Plus 3"	K2 = Relay for visual alarm	T1 = Ignition coil
A3 = Auto Alarm "Plus 4"	M5 = Starting motor	V1 = Infrared pre-amplifier
B1 = Alarm horn	S2 = Door contact switch, pos. switching	V3 = Priming indicator LED
E1 = Interior lamp, front	S3 = Engine compartment switch	X1 = Plug, alarm relay
E2 = Engine compartment light	S4 = Trunk switch	X2 = Plug, evaluation electronics
E3 = Trunk light	S5 = Door contact switch, neg. switching	br = brown
F1, F2 = Fuses 8A	S6 = Ignition/starting switch	gr = grey
		sw = black
		rt = red



BASIC CIRCUIT OF CENTRAL-LOCKING MODULE

1 = Constant negative potential

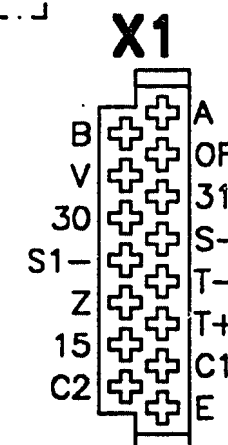
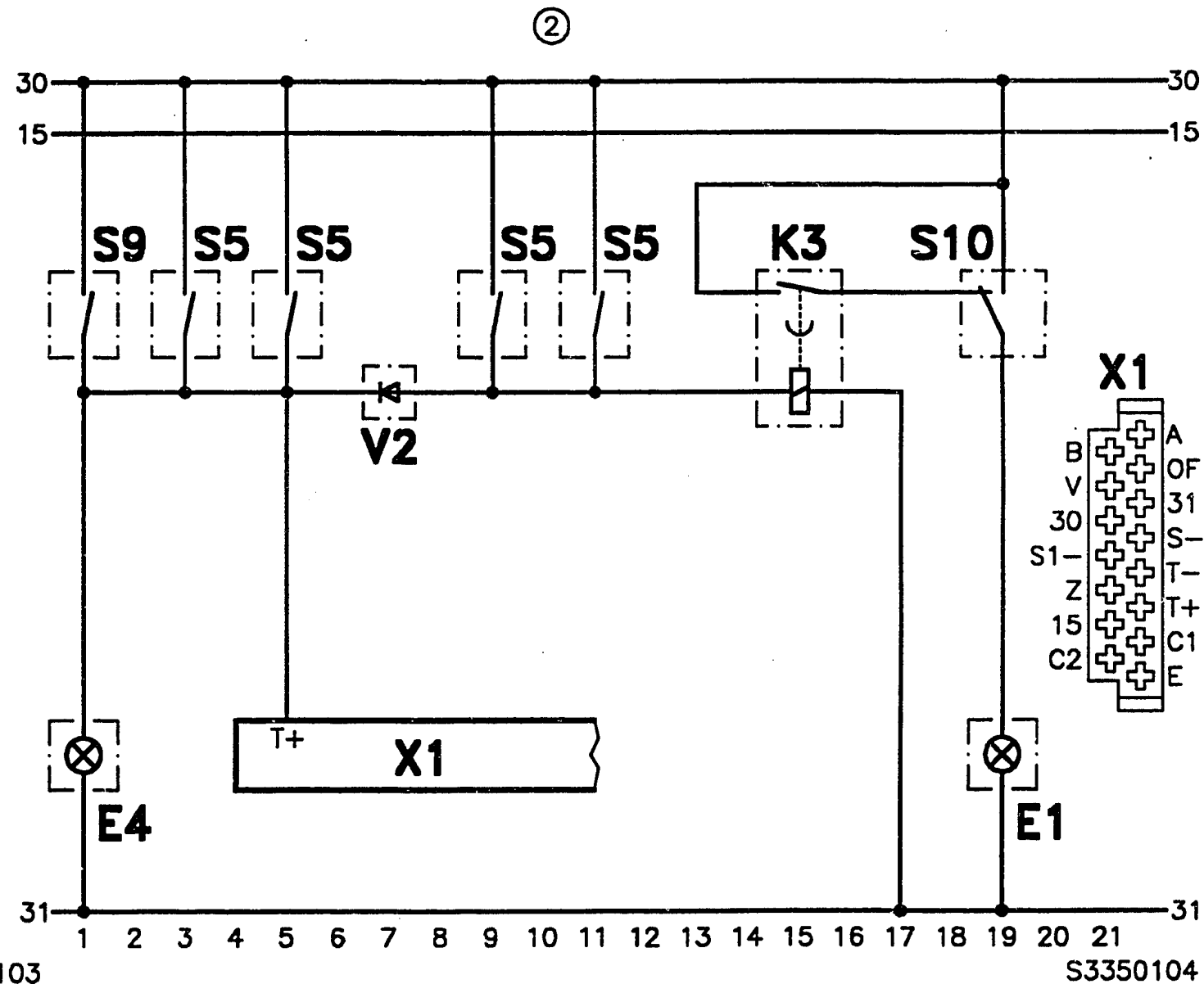
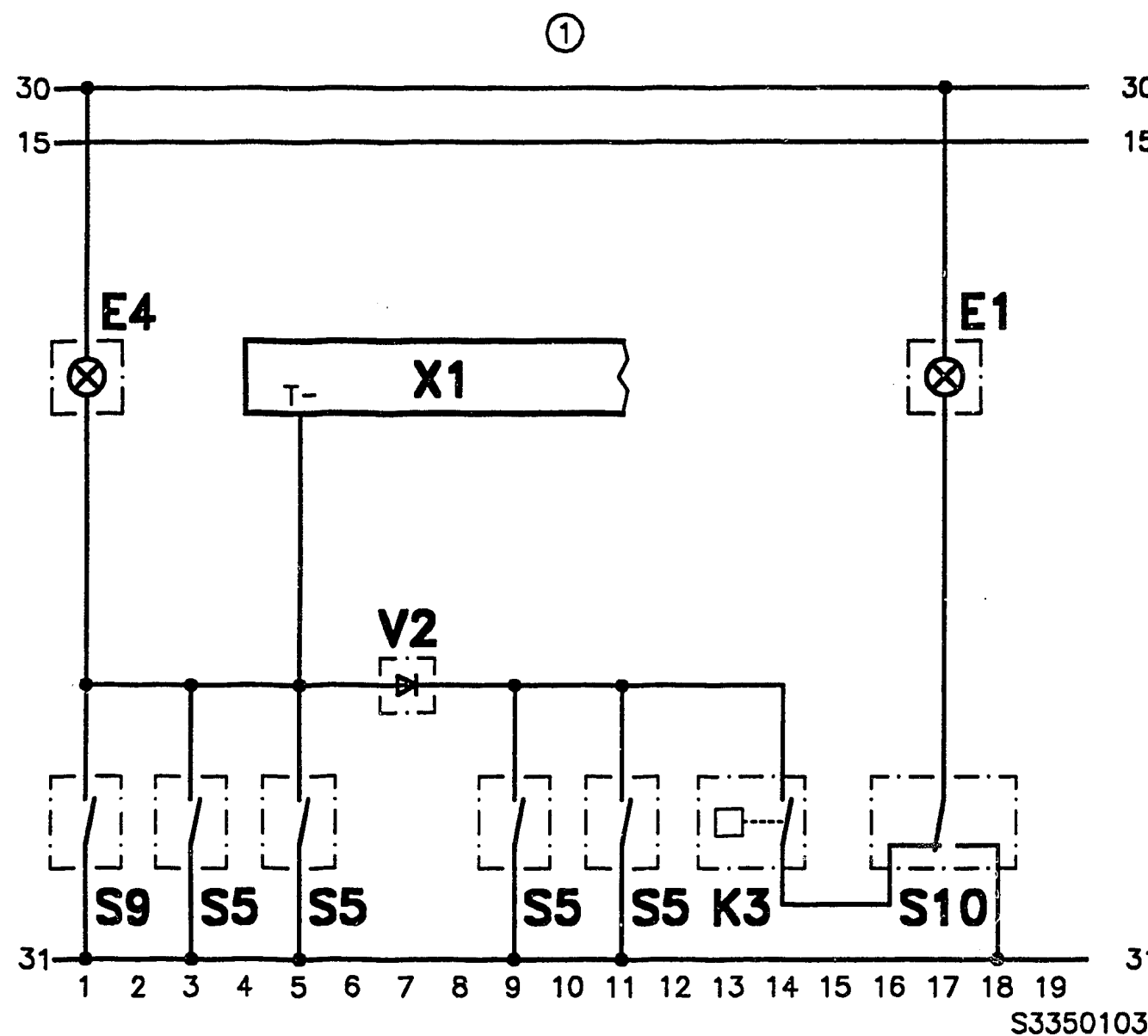
2 = Constant positive potential

3 = Actuated with activator by pump

4 = With separate activator.

A4 = Central-locking control unit
M3 = Control motor
M4 = Control motor without activator

S11 = Door activator
X3 = 4-pole plug, central-locking module
X4 = 6-pole plug, central-locking module



SPECIAL CIRCUITS FOR REAR INTERIOR LAMP

1 = Door contact switch, neg. switching | 2 = Door contact switch, pos. switching

E1 = Interior lamp, front
 E4 = Interior lamp, rear
 K3 = Time-lag relay
 S5 = Door contact switch

S9 = Switch for interior lamp, rear
 S10 = Switch in interior lamp, front
 V2 = Blocking diode
 X1 = Plug, alarm relay

INSTALLATION POSITION OF COMPONENTS

- * Install alarm relay, central-locking module in passenger compartment at arbitrary location (e.g. beneath instrument panel) with connections downwards.
- * Infrared pre-amplifier in instrument panel or so as to be easy to operate from driver's door
- * Ultrasonic sensor in passenger compartment. Above rear-view mirror or in centre of instrument panel.
- * Anti-tow safeguard in passenger compartment or trunk.
- * CL activator behind driver's door trim.
- * Priming indicator (LED) at any readily visible location in passenger compartment.

For production reasons:
continued on the following
coordinate.

Trouble-shooting instructions : ALL-5007

BOSCH system : Alarm system 20i matic

Make of vehicle : General

Basic microcard : KFZ-00..

TABLE OF CONTENTS

Section	Coordinates
Special features	02
Structure, usage	02
Safety and precautionary measures	03
Test prerequisites	03
Trouble-shooting chart	04
Rapid diagnosis chart	07
Test specifications	21
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Installation position of components, removal and fitting instructions	28

SPECIAL FEATURES

This microcard, valid at the time of publication, contains trouble-shooting instructions for the following alarm system:

Auto Alarm 20i matic 0 335 411 9.. with trigger box 0 335 411 036 and evaluation electronics 1 987 335 012 also in combination with:

- * Auto Alarm Plus 3 (wheel protection)
- * Auto Alarm Plus 4 (passenger-compartment protection)
- * Central-locking module
- * Priming indicator (LED)

IMPORTANT:
Leads of ultrasonic sensor, of anti-tow safeguard and infrared pre-amplifier must not be extended and must not be laid in parallel.

STRUCTURE, USAGE

These brief instructions essentially comprise vehicle-specific special features and test specifications (set values).

In line with the customer complaint, the trouble-shooting chart leads to various causes/component faults. A detailed description of trouble-shooting is given in the trouble-shooting chart in the basic instructions.

NOTE: Even if reference is made to basic instructions, the set values, terminal assignments and special features indicated in these vehicle-specific brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

As a general rule alarm systems are maintenance-free. Attention must be paid to the following when working on vehicles with an alarm system fitted.

- * Detach plug of electronic trigger box when carrying out welding work using electric welding equipment.
- * When performing painting work, the electronic trigger box may be subjected to max. + 95° C for brief periods and max. +85° C for long periods (approx. 2 hours).
- * Make sure battery terminals are properly tightened at terminal posts of battery.
- * Do not use a fast charger to start engine.
- * Never disconnect battery from vehicle electrical system with engine running.
- * Detach battery from vehicle electrical system when carrying out fast charging.
- * Do not detach or attach wiring-harness plugs of trigger boxes with ignition switched on.

TEST PREREQUISITES

- * Alarm system installed as per installation instructions.
- * All plug contacts O.K.
- * Spring contacts in plugs engaged.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

The fault characteristics outlined below may be due to one or more faults.

1. False alarm with Auto Alarm 20i matic following installation with system primed.
2. False alarm with Auto Alarm 20i matic after system has already been functioning properly for some time.
3. No alarm with Auto Alarm 20i matic, alarm system switched on by way of infrared key.

Cause (component fault)		
X		Circuit fault on installation of system, door contacts must not be connected to S- and S1-
X		Contact switches of hood and trunk lid are not connected to S- and S1-
X	X	Positive or negative fan motor incorrectly connected
	X	Loose contact in ground lead of load routed via terminal R of alarm relay
	X X	Short circuit or short to ground between leads
	X	Contact switches, leads or fuse defective
	X	Interior lamp on: Power supply of alarm relay interrupted; alarm relay, evaluation electronics or alarm horn defective

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

The fault characteristics indicated below may be caused by one or more faults.

4. No alarm in the case of Auto Alarm 20i matic, alarm system primed via infrared key.
5. No alarm in the case of Auto Alarm 20i matic with additional Auto Alarm Plus 3 (wheel protection). Alarm system primed.
6. No alarm in the case of Auto Alarm 20i matic with additional Auto Alarm Plus 4 (passenger compartment protection). Alarm system primed.
7. Sudden alarm in the case of Auto Alarm 20i matic with Auto Alarm Plus 4 and auxiliary heating.

			Cause (component fault)
X			If engine compartment or trunk lighting O.K., fault is to be found in alarm relay or lead
X			Short circuit or short to ground in contact switch or lead to connected load
X			Plug connections dropped off at alarm relay or angle encoder
X			Evaluation electronics, wheel protection or angle encoder defective
	X		Evaluation electronics or ultrasonic detector defective
		X	Movement of air in passenger compartment due to start-up of auxiliary heating

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

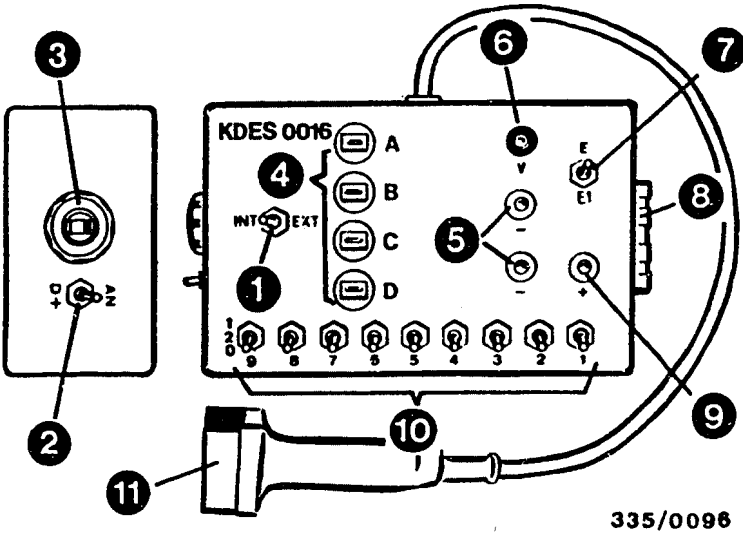
The fault characteristics indicated below may be caused by one or more faults.

8. Restricted range of infrared key in the case of Auto Alarm 20i matic.
9. Auto Alarm System 20i matic cannot be primed with infrared key or cannot be switched off during alarm situation.
10. Sudden alarm in the case of Auto Alarm 20i matic without Alarm Plus 4 and auxiliary heating.
11. Alarm system is not automatically primed after 30 seconds.
12. Priming indicator in infrared pre-amplifier doesn't function.

				Cause (component fault)
X				Batteries in infrared key defective or weak
	X			Infrared evaluation electronics defective
		X		Run-out of heating-blower motor acts as generator. Trigger box detects voltage via term. 15 and triggers alarm.
X	X		X	Infrared pre-amplifier (receiver) defective
		X	X	Alarm relay defective

RAPID DIAGNOSIS CHART FOR ALARM-SYSTEM TESTER KDES 0016

Test step	Testing of component/function	Additional operation	Test conditions/ test instructions/ possible causes of trouble	Set values
1	Hand trans-mitter	Set encoding switch, item 10 to code of hand transmitter to be tested.	* Plug, item 11 connected to tester. * Switch 2 set to D+ * Switch 1 set to int. * Switch 7 set to E	
	Priming and depriming of alarm system.	Apply voltage of approx. 12 V. Item 9 (+) Item 5 (-)	For testing the hand trans-mitter, use is made of the built-in components in the tester (infrared pre-amplifier and evaluation electronics).	
	Priming	Direct hand transmitter towards infrared pre-amplifier and press button on hand trans-mitter	LED in hand transmitter must light up brightly	LED in infrared pre-amplifier flashes for approx. 3 s
	Depriming	Direct hand transmitter towards infrared pre-amplifier and press button on hand trans-mitter	LED in hand transmitter must light up brightly * Hand transmitter defective * BA in hand transmitter too weak * Tester KDES 0016 defective	LED in infrared pre-amplifier lights up constantly for approx. 3 s



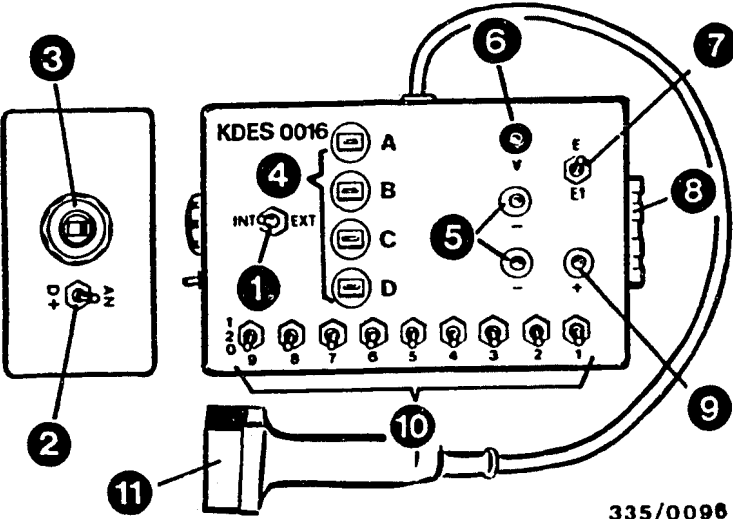
335/0096

- 1 = Changeover switch for infrared pre-amplifier (internal/external)
- 2 = Nonlocking switch D+/AN
- 3 = Infrared pre-amplifier installed.
- 4 = Flat-contact sockets for external infrared pre-amplifier.
- 5 = Ground sockets
- 6 = Measurement output
- 7 = Changeover switch E/E1
- 8 = Evaluation electronics installed.
- 9 = Socket for voltage supply (+)
- 10 = Encoding switch 1 ... 9
- 11 = Plug for evaluation electronics

A for red lead (+)
B for black lead
C for grey lead
D for brown lead (-)
of infrared pre-amplifier, external.

RAPID DIAGNOSIS CHART FOR ALARM-SYSTEM TESTER KDES 0016 (CONTINUED)

Test step	Testing of component/function	Additional operation	Test conditions/ test instructions/ possible causes of trouble	Set values
2	Evaluation electronics Actuation of LED and activation of evaluation electronics LED in infrared pre-amplifier Activation of evaluation electronics	For testing, use hand transmitter with same encoding as evaluation electronics. Apply voltage of approx. 12 V. Item 9 (+) Item 5 (-) Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	Evaluation electronics 1 987 335 012 removed * Detach plug for evaluation electronics, item 11 from tester and attach it to evaluation electronics 1 987 335 012 to be tested. * Switch, item 1 set to int. * Switch, item 7 set to E * Connect voltmeter to item 5 and item 6 To test evaluation electronics, use is made of the built-in infrared pre-amplifier in the tester and the appropriate hand transmitter for the evaluation electronics. Nonlocking switch, item 2 set to D+ LED in hand transmitter must light up brightly * Hand transmitter defective * Evaluation electronics defective * Tester KDES 0016 defective	 LED in infrared pre-amplifier lights up constantly Voltage on voltmeter goes to less than/equal to 1.5 V for approx. 3 s



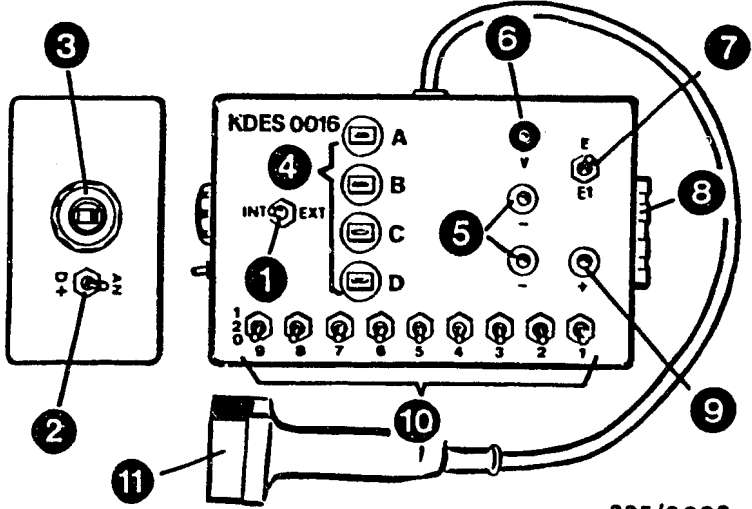
335/0096

- 1 = Changeover switch for infrared pre-amplifier (internal/external)
- 2 = Nonlocking switch D+/AN
- 3 = Infrared pre-amplifier installed.
- 4 = Flat-contact sockets for external infrared pre-amplifier.
- 5 = Ground sockets
- 6 = Measurement output
- 7 = Changeover switch E/E1
- 8 = Evaluation electronics installed.
- 9 = Socket for voltage supply (+)
- 10 = Encoding switch 1 ... 9
- 11 = Plug for evaluation electronics

A for red lead (+)
B for black lead
C for grey lead
D for brown lead (-)
of infrared pre-amplifier, external.

RAPID DIAGNOSIS CHART FOR ALARM-SYSTEM TESTER KDES 0016 (CONTINUED)

Test step	Testing of component/function	Additional operation	Test conditions/ test instructions/ possible causes of trouble	Set values
3	Infrared pre-amplifier	Use hand transmitter with same encoding as evaluation electronics for testing.	Infrared pre-amplifier 1 987 335 010 removed * Plug, item 11 connected to tester. * Switch, item 2 set to D+ * Switch, item 1 set to ext. * Switch, item 7 set to E * Connect ext. infrared pre-amplifier to tester: red lead to A black lead to B green lead to C brown lead to D	
	Priming and depriming of alarm system	Apply voltage of approx. 12 V. Item 9 (+) Item 5 (-)	To test infrared pre-amplifier, use is made of built-in evaluation electronics in tester and an arbitrary hand transmitter. The code of the hand transmitter must be set on the tester with the encoding switches, item 10.	
	Priming	Direct hand transmitter towards infrared pre-amplif. and press button on hand transmitter	LED in hand transmitter must light up brightly	LED in infrared pre-amplifier flashes for approx. 3 s
	Depriming	Direct hand transmitter towards infrared pre-amplifier and press button on hand transmitter	LED in hand transmitter must light up brightly * Evaluation electronics in tester incorrectly coded * Hand transmitter defective * Infrared pre-amplifier defective * Tester KDES 0016 defective	LED in infrared pre-amplifier lights up constantly for approx. 3 s



335/0096

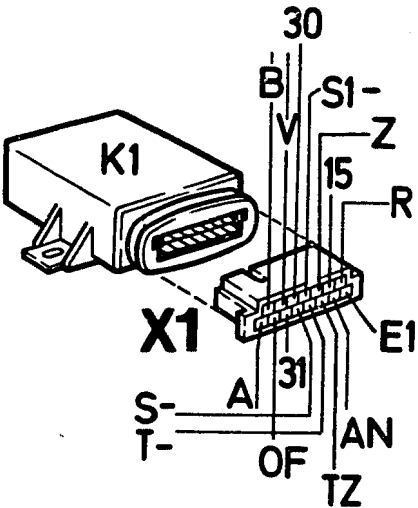
- 1 = Changeover switch for infrared pre-amplifier (internal/external)
- 2 = Nonlocking switch D+/AN
- 3 = Infrared pre-amplifier installed.
- 4 = Flat-contact sockets for external infrared pre-amplifier.
- 5 = Ground sockets
- 6 = Measurement output
- 7 = Changeover switch E/E1
- 8 = Evaluation electronics installed.
- 9 = Socket for voltage supply (+)
- 10 = Encoding switch 1 ... 9
- 11 = Plug for evaluation electronics

A for red lead (+)
B for black lead
C for grey lead
D for brown lead (-)
of infrared pre-amplifier, external.

RAPID DIAGNOSIS CHART

Component installed in vehicle (trigger box 0 335 411 036)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
1	Supply voltage term. 30, ignition off, vehicle stopped	30	greater than/equal to 10 V
2	Supply voltage term. 15, ignition on, vehicle stopped	15	greater than/equal to 10 V
3	Supply voltage, relay contact for alarm horn actuation	B	greater than/equal to 10 V
4	Ignition off. Prime system with infrared key. If auxiliary unit "Plus 4" is connected. (voltage measurement) If auxiliary unit "Plus 4" is not connected (resistance measurement).	Z	primed < 2.7 V deprimed > 10 V primed < 1 k Ω deprimed > 1 M Ω
5	With additionally installed alarm system " Plus 4 " Alarm system primed: door closed door open Alarm must sound immediately on opening door.	TZ	greater than/equal to 10 V approx. 0 V



335/0097-2

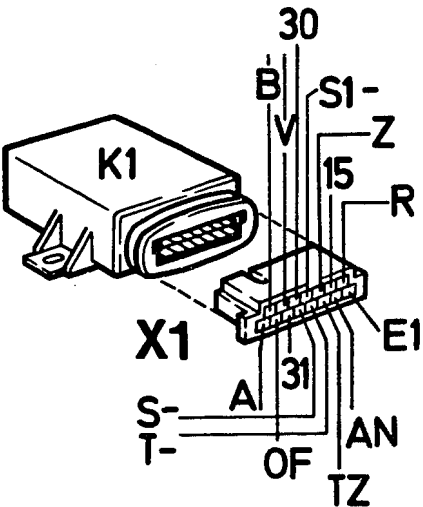
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
AN = Evaluation electronics
B = Fuses, term. 30
E1 = Evaluation electronics
OF = Relay K2, term. 85
R = Ground loop
S- = Trunk switch
S1- = Engine compartment switch
T- = Door contact switch
negative switching
TZ = Pass. compart. protection S-
V = Relay K1, term. 85
Z = Auxiliary units such as
"Plus 3 or Plus 4"
15 = Ignition/starting switch
S2, term. 15.
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 1)

Component installed in vehicle (0 335 411 036)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
6	AS primed: door closed door open Alarm must sound immediately on opening door.	T-	greater than/equal to 10 V approx. 10 V
7	AS primed: trunk lid closed open trunk lid Alarm must sound immediately on opening trunk lid.	S-	greater than/equal to 10 V approx. 0 V
8	AS primed: hood closed open hood Alarm must sound immediately on opening hood.	S1-	greater than/equal to 10 V approx. 0 V
9	Supply voltage term. 15, ignition on. If no relay is externally connected (resistance measurement) If relay is externally connected (voltage measurement)	V	primed > 1 M Ω deprimed approx. 0 Ω primed > 10 V deprimed < 2.7 V
10	Term. R must be connected to ground before priming alarm system. Prime alarm system with infrared key. Disconnect electrical connection at R. It must only be possible to switch off alarm with infrared key.	R	Alarm must sound immediately



335/0097-2

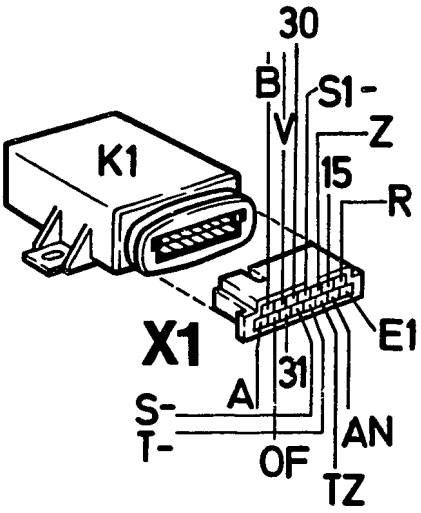
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
AN = Evaluation electronics
B = Fuses, term. 30
E1 = Evaluation electronics
OF = Relay K2, term. 85
R = Ground loop
S- = Trunk switch
S1- = Engine compartment switch
T- = Door contact switch
negative switching
TZ = Pass. compart. protection S-
V = Relay K1, term. 85
Z = Auxiliary units such as
"Plus 3 or Plus 4"
15 = Ignition/starting switch
S2, term. 15.
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 2)

Component installed in vehicle (0 335 411 036)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
11	AS primed, trigger alarm by opening door Use analog multimeter	A	less than 2 V greater than 10 V intermittent
12	AS primed, trigger alarm by opening door Use analog multimeter with relay Alarm system off	OF	less than 2 V greater than 10 V intermittent greater than 10 V
13	Ground connection from alarm relay to vehicle ground	31	approx. 0 Ω
14	Prime alarm system with infrared key Trigger alarm, LED in infrared pre-amplifier lights up	AN	Voltage goes to 0 V
15	Prime alarm system with infrared key	E1	Voltage goes from approx. 10 V for 3 s to less than/equal to 1.5 V



335/0097-2

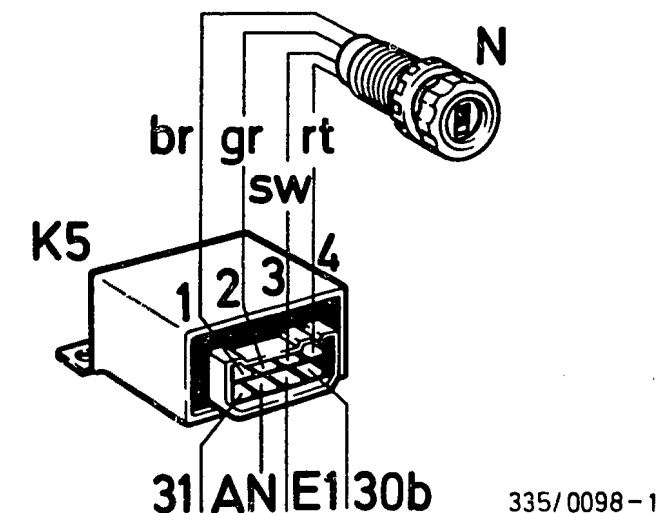
K1 = Alarm relay
X1 = Plug, alarm relay

Connections:
A = Alarm horn B1
AN = Evaluation electronics
B = Fuses, term. 30
E1 = Evaluation electronics
OF = Relay K2, term. 85
R = Ground loop
S- = Trunk switch
S1- = Engine compartment switch
T- = Door contact switch
negative switching
TZ = Pass. compart. protection S-
V = Relay K1, term. 85
Z = Auxiliary units such as
"Plus 3 or Plus 4"
15 = Ignition/starting switch
S2, term. 15.
30 = Fuses, term. 30
31 = Vehicle ground

RAPID DIAGNOSIS CHART (CONTINUATION 3)

Evaluation electronics 1 987 335 012 only in conjunction with alarm relay
0 335 411 036 installed in vehicle

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
1	Given voltage at AN it must no longer be possible to prime AS AS deprimed	AN (ANZ)	greater than 2.5 V
2	Irrespective of whether AS primed or deprimed, briefly link electrical connection at E1 to term. 31. Alarm must be given immediately and it must only be possible to deactivate it with hand transmitter AS primed AS deprimed	E1	greater than 10 V greater than 10 V
3	Supply voltage, evaluation electronics Ignition off	30b	greater than/equal to 10 V
4	Ground connection - evaluation electronics	31	approx. 0 Ω
5	Ground connection - infrared pre-amplifier (brown)	1	approx. 0 Ω
6	Signal line to infrared pre-amplifier (gray) Measure with analog multimeter Prime AS, LED flashes for approx. 3 s Deprime AS, LED lights up for approx. 3 s	2	approx. 3...4 V approx. 6 V
7	Signal lead from infrared pre-amplifier (black), measure with analog multimeter	3	greater than 3 V/ less than 9 V pulsating
8	Supply voltage - infrared pre-amplifier (red)	4	greater than/equal to 10 V



K5 = Evaluation electronics
N = Infrared pre-amplifier

Connections:
AN = Alarm relay
E1 = Alarm relay
30b = Fuses, term. 30
31 = Vehicle ground
1 = Brown lead to N
2 = Gray lead to N
3 = Black lead to N
4 = Red lead to N

TEST SPECIFICATIONS

Auto Alarm 20i matic

- * Battery voltage 10...13 V
- * Priming delay:
After switching off ignition and leaving vehicle, i.e. opening of at least one door and closing of last door or trunk, the alarm system is primed automatically after 30 s.
- * Alarm time audio 25...30 sec.
 visual less than 4 min.
- * Response time immediately

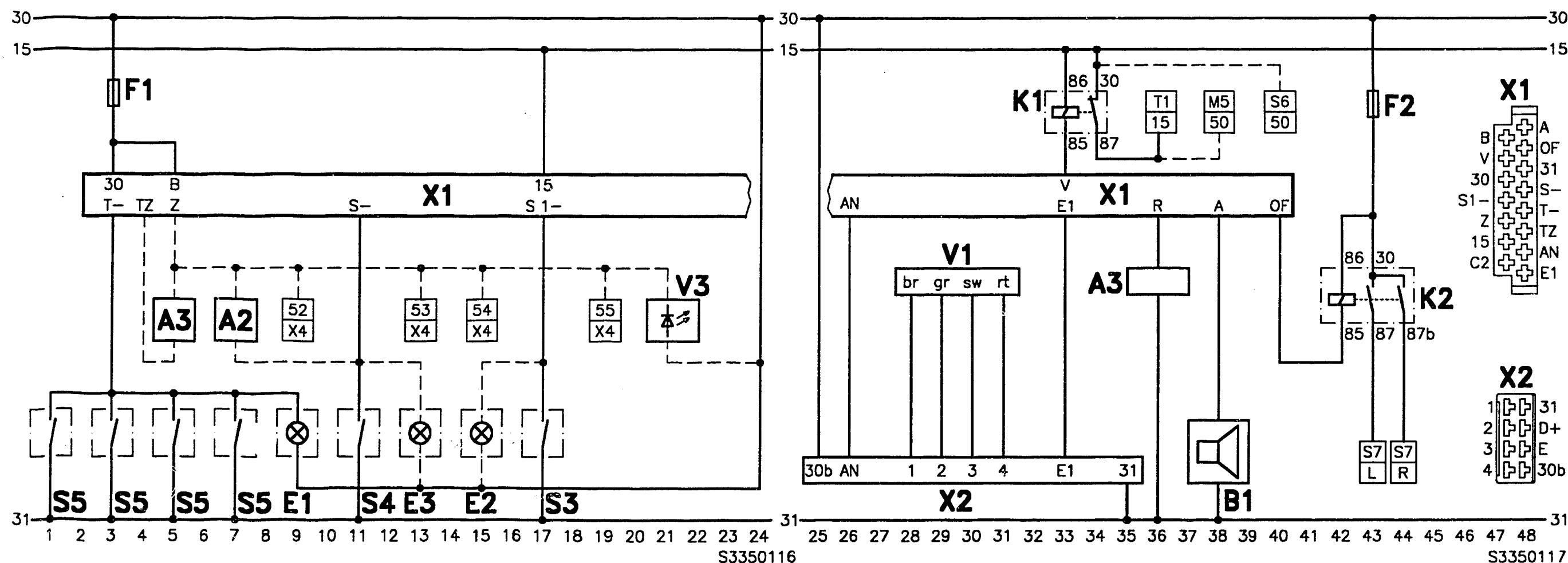
Auto Alarm Plus 3

- * Battery voltage 9...13 V
- * Adjustment time of angle encoder approx. 45...55 sec.
- * Response time approx. 1... 2 sec.

For production reasons:
continued on the following
coordinate.

Auto Alarm Plus 4

- * Battery voltage 10...13 V
- * Alarm time audio 25...30 sec.
 visual less than 4 min.
- * Response time 1...2 sec.

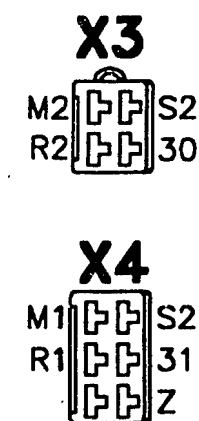
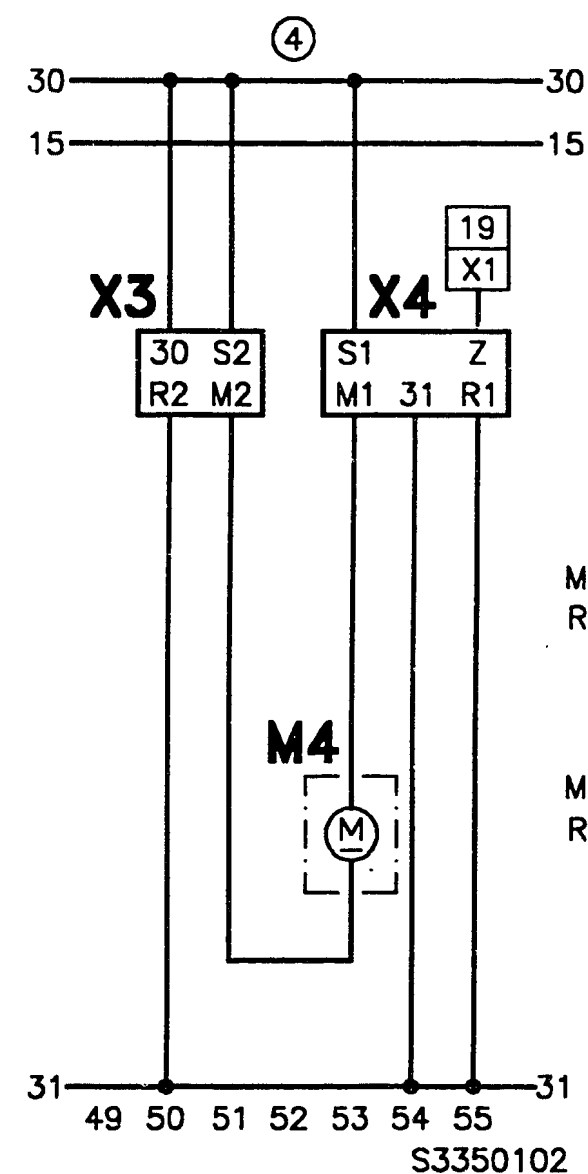
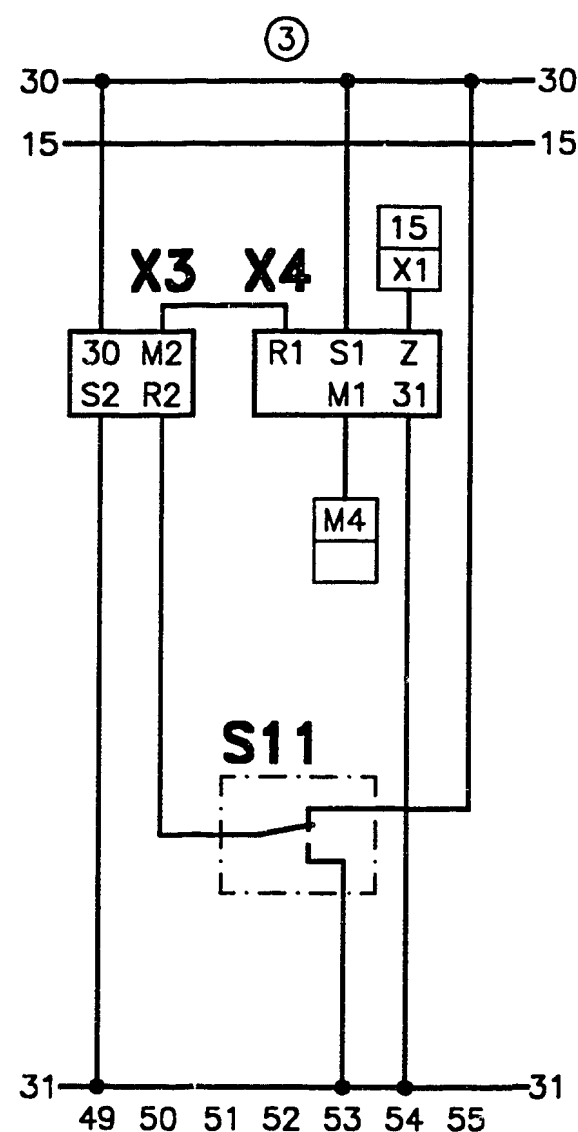
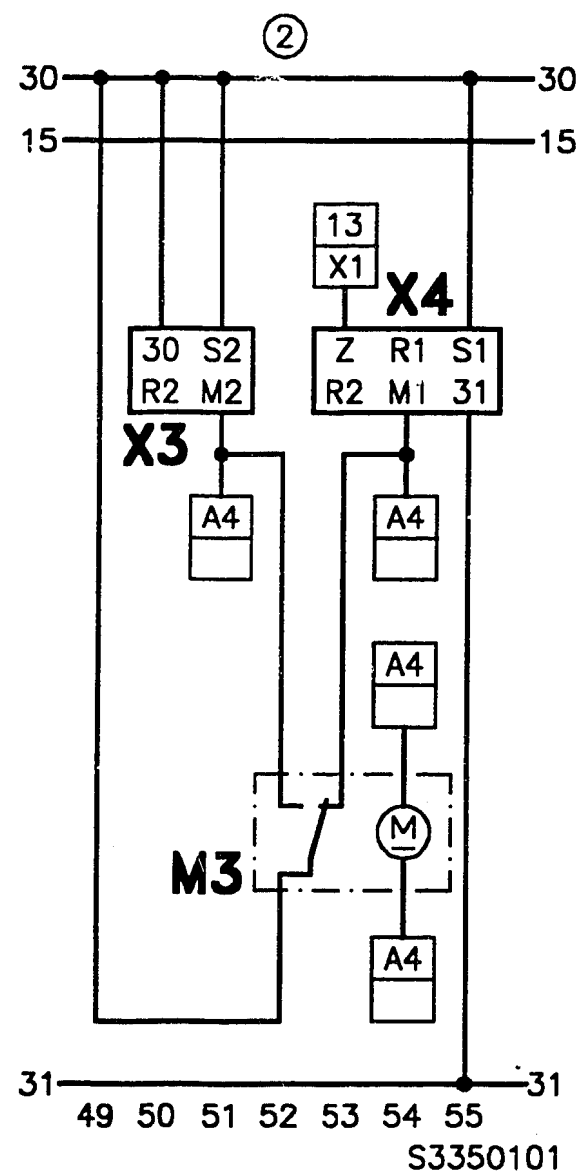
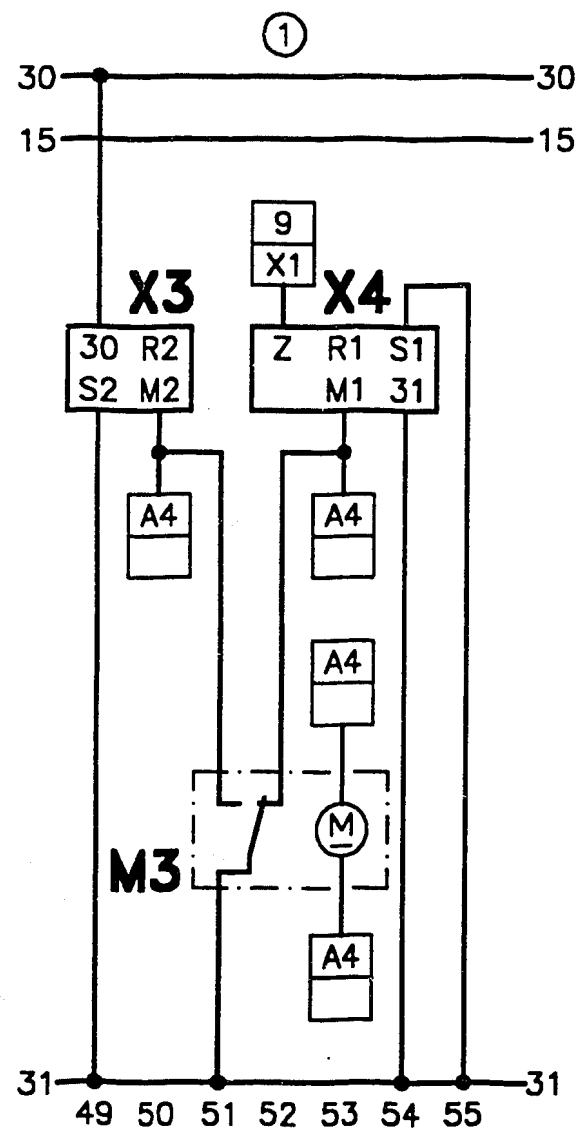


ELECTRICAL TERMINAL DIAGRAM

A1 = Car radio
A2 = Auto Alarm "Plus 3"
A3 = Auto Alarm "Plus 4"
B1 = Alarm horn
E1 = Interior lamp, front
E2 = Engine compartment light
E3 = Trunk light
F1, F2 = Fuses 8A

K1 = Relay for ignition/starting disable
K2 = Relay for visual alarm
M5 = Starting motor
S3 = Engine compartment switch
S4 = Trunk switch
S5 = Door contact switch, negative switching
S6 = Ignition/starting switch
S7 = Turn-signal switch

T1 = Ignition coil
V1 = Infrared pre-amplifier
V3 = Priming indicator LED
X1 = Plug, alarm relay
X2 = Plug, evaluation electronics
br = brown
gr = gray
rt = red
sw = black



BASIC CIRCUIT OF CENTRAL-LOCKING MODULE

1 = Constant negative potential

2 = Constant positive potential

3 = Actuated with activator by pump

4 = With separate activator.

A4 = Central-locking control unit

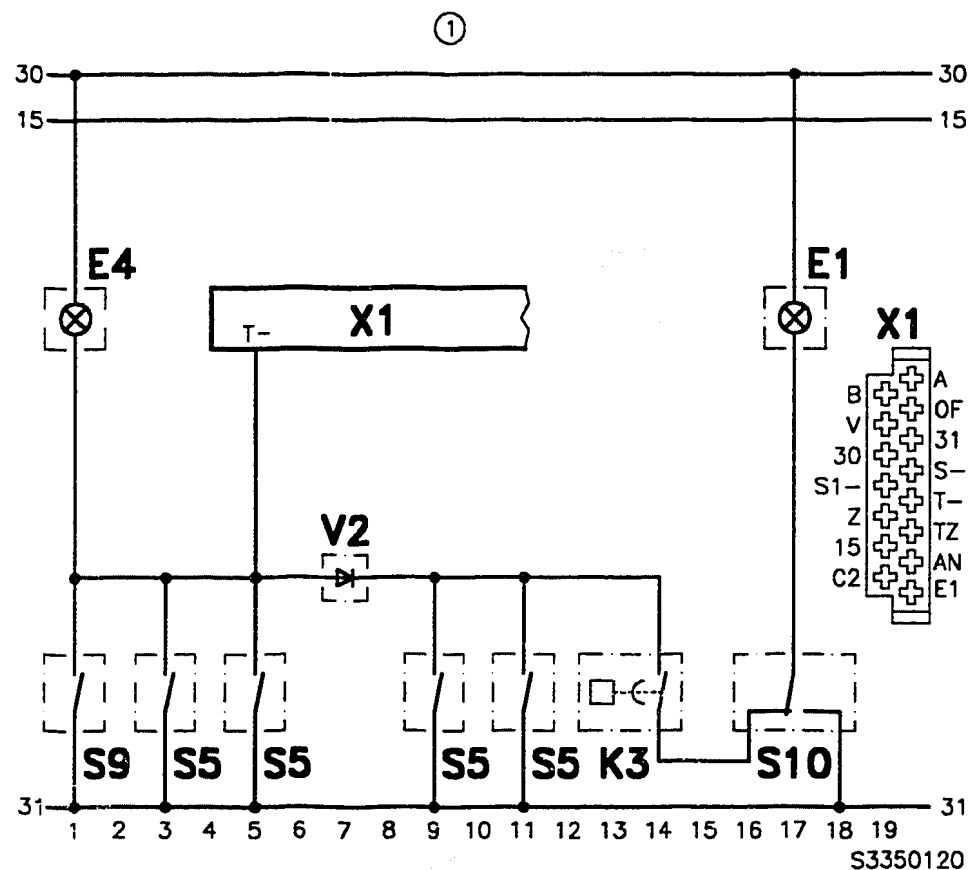
M3 = Control motor

M4 = Control motor without activator

S11 = Door activator

X3 = 4-pole plug, central-locking module

X4 = 6-pole plug, central-locking module



SPECIAL CIRCUIT FOR REAR INTERIOR LAMP

E1 = Interior lamp, front
 E4 = Interior lamp, rear
 K3 = Time-lag relay
 S5 = Door contact switch
 S9 = Switch for interior lamp, rear
 S10 = Switch in interior lamp, front
 V2 = Blocking diode
 X1 = Plug for alarm relay

INSTALLATION POSITION OF COMPONENTS

- * Install alarm relay, central locking module in passenger compartment at arbitrary location (e.g. beneath instrument panel) with connections downwards.
- * Infrared pre-amplifier in instrument panel or so as to be easy to operate from driver's door.
- * Ultrasonic sensor in passenger compartment. Above rear-view mirror or in center of instrument panel.
- * Anti-tow safeguard in passenger compartment or trunk.
- * CL activator behind driver's door trim.
- * Priming indicator (LED) at any readily visible location in passenger compartment.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty (warm and cold)
2. Engine hunts when idling
3. Rough idling with warm engine
4. High fuel consumption in conjunction with inadequate engine power and smoke formation
5. Inadequate performance
6. Black fumes in full-load range in conjunction with hard engine running, possible loss of power
7. Hard engine running

Cause (component fault)					
*	*			*	Tank empty, tank ventilation
*		*			Injection sequence not firing sequence
	*			*	Inlet/return hollow screws
*					Shutoff device
	*			*	Air in fuel system
	*				Paraffin separation
					Leak in fuel lines
*				*	Fuel lines clogged
*				*	Supply lines clogged
				*	Engine air filter
	*				Idle speed
*	*			*	Injection nozzle
*					Glow plug system
*				*	Fuel filter
				* * *	Timing device
*	*				Engine compression
				* * *	Pump - engine assignment
				* * *	Engine management

D03



TROUBLE-SHOOTING CHART (continued)

Customer complaint (fault symptoms)

8. Engine misfires while driving
9. Engine cannot be shut off
10. Incorrect engine speeds
11. Engine won't rev up when cold
12. High idle or rough engine running at high speed
13. Black fumes in full-load range
14. White fumes in full-load range

Cause (component fault)					
*					Tank empty, tank ventilation
*					Injection sequence not firing sequence
*					Inlet/return hollow screws
*	*				Shutoff device
*					Air in fuel system
*					Paraffin separation
*					Leak in fuel lines
*					Fuel lines clogged
*					Supply lines clogged
				*	Engine air filter
	*				Idle speed
*					Injection nozzle
*					Fuel filter
				*	Timing device
		*			Engine compression
		*		*	Pump - engine assignment
*					Engine management

D04



TESTING GLOW PLUG SYSTEM

The glow plug system of the 23 YD-, 23 YDT - and 23 DTR engines is equipped with a preheating relay with short-circuit-current monitoring and self-diagnosis.

On the glow plug system, faults are indicated by flashing either immediately or after starting depending on the type of fault.

Self-diagnosis test program

Test instructions	Flashing time	Flashing pulses per minute	Start of flashing pulses	Component
Ignition "On"				
a) Engine is not started	1 minute	60 X	after 1 min.	Sheathed-element glow plugs defective
b) Start after glow-plug indicator lamp goes out	1 minute	60 X	after start	Sheathed-element glow plugs defective
c) Premature start	1 minute	60 X	after start	Sheathed-element glow plugs defective
Ignition "On"				
Engine is not started	1 minute	240 X	immediately after ignition on	a) Glow-time relay defective b) Open circuit in lead to sheathed-element glow plug c) Check for open circuit in lead, term. 30, starting motor to glow-time relay
Short-circuit prior to "ignition on" and during starting and safety time	1 minute	60 X	immediately	Sheathed-element glow plug - Check connection G1 and G2 with respect to ground

TEST SPECIFICATIONS

Idle speed:

Engine type	Type of inj. pump	Transmission	Idle speed
2.3 YD	VE..L243	MT	700 + 50 min ⁻¹
2.3 YD	VE..L243-2	AT	700 + 50 min ⁻¹
2.3 YD	VE..L243-2	AT/AC	800 - 50 min ⁻¹
2.3 YD*	VE..L243-5	AT/AC	800 - 50 min ⁻¹
2.3 YDT	VE..L156	MT	700 + 50 min ⁻¹
2.3 YDT	VE..L156-1	AT	700 + 50 min ⁻¹
2.3 YDT	VE..L156-1	AT/AC	800 - 50 min ⁻¹
2 3 DTR*	VE..L297	AT/AC	800 - 50 min ⁻¹

MT = Mechanical manual transmission

AT = Automatic transmission

AC = Air conditioner

* = as of model year 89

Pump - engine assignment

Engine setting : TDC at cyl. no. 1

Pump setting :

Engine YD : 0.98 - 0.05 mm after BDC

YTD : 0.85 - 0.05 mm after BDC

DTR : 0.85 - 0.05 mm after BDC

Note:

Prior to installation of pump at flywheel mark "P", mark on drive pinion (corresponds to position of keyway on drive shaft) must point towards outlet "D".

Vacuum values, EGR

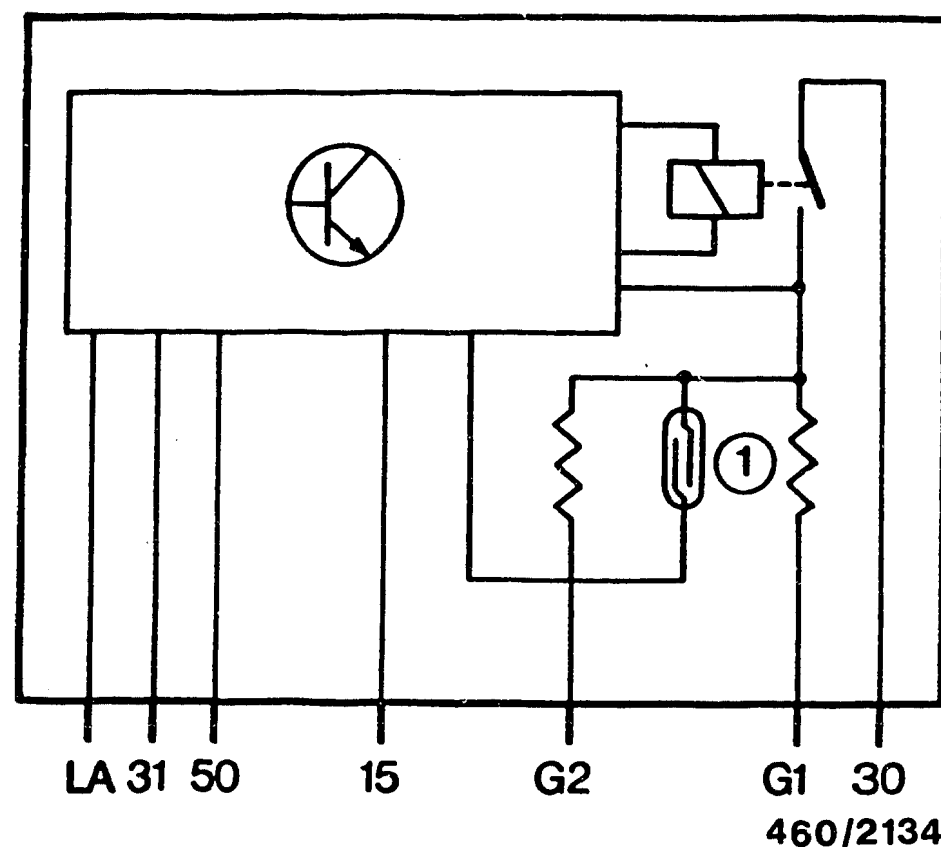
Idle speed:

700...750 min ⁻¹ approx. 420 mbar

4500 min ⁻¹ approx. 180 mbar

TIGHTENING TORQUES

Nozzle-holder assembly	70 Nm
Sheathed-element glow plugs	20 Nm
Fastening screws Fuel-injection pump	25 Nm
Nut, driver at fuel-injection pump	55 Nm
Fuel lines	20 Nm
Bleeder screw	20..32 Nm



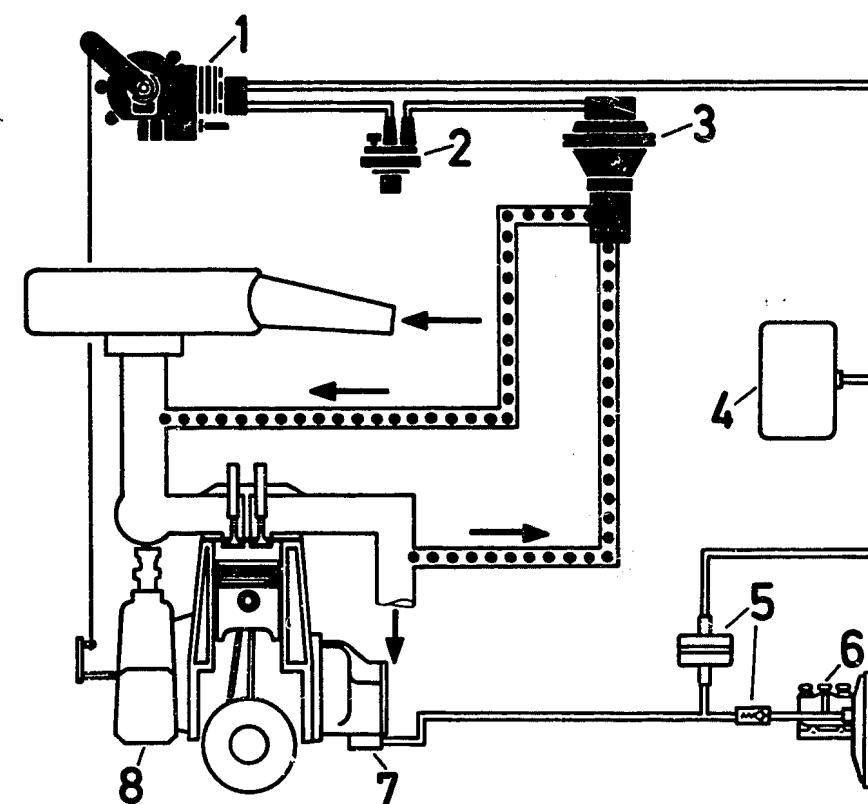
- 1 = Reed contact
- 15 = from ignition lock
- 30 = from starting motor
- 31 = Ground
- 50 = Starting motor
- G1 = Sheathed-element glow plug 1 and 2
- G2 = Sheathed-element glow plug 3 and 4
- LA = Indicator lamp

Note on glow-time relay:

2 sheathed-element glow plugs are supplied with voltage in each case (G1 and G2).

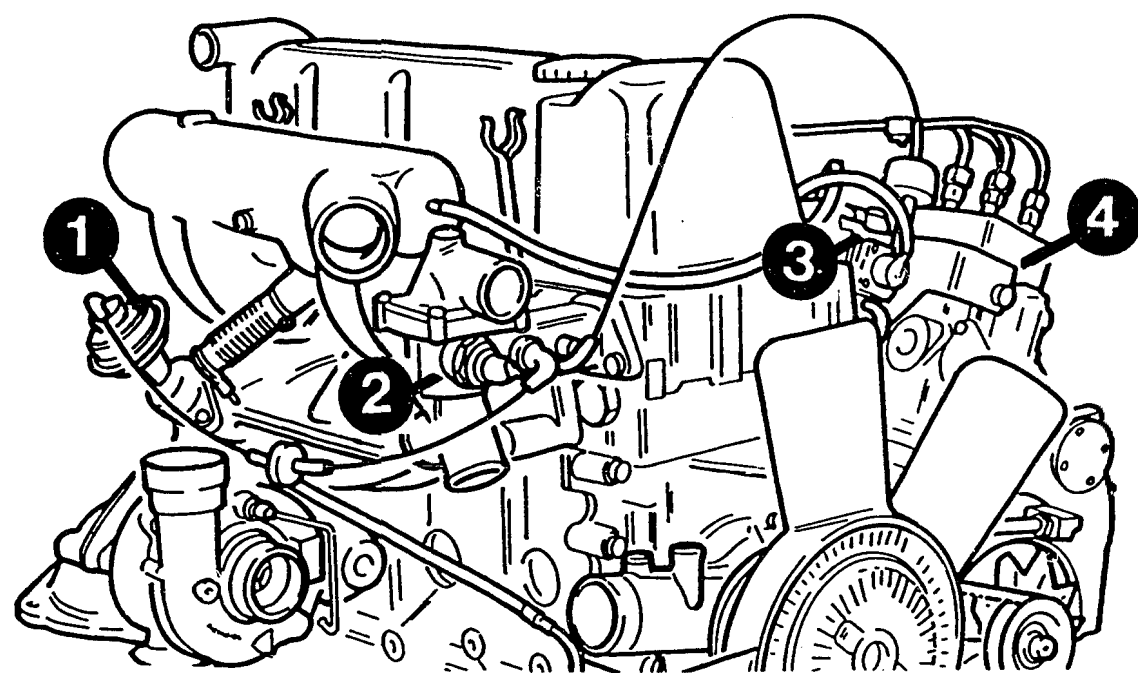
If one sheathed-element glow plug drops out in line G1, a difference voltage is produced and the Reed contact triggers the flashing signal.

If a sheathed-element glow plug likewise drops out at the second line G2, there is no longer any voltage difference and the flashing signal stops.



BLOCK DIAGRAM, EGR

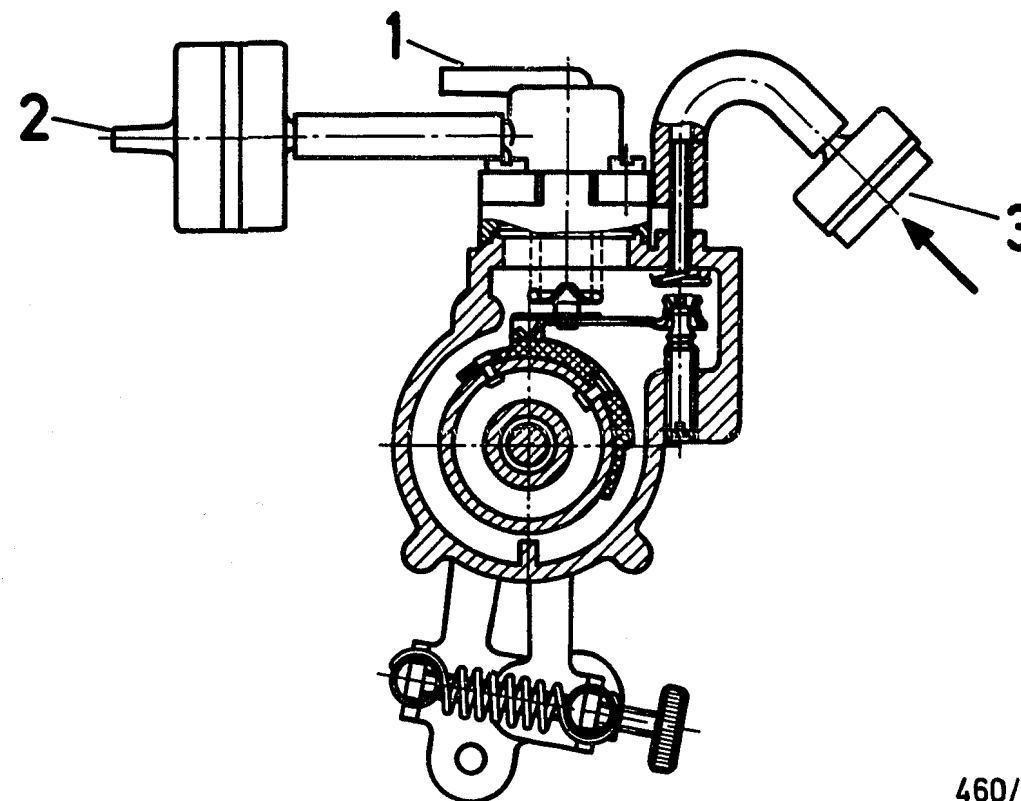
- 1 = Mechanical pressure transformer
- 2 = Thermo-valve (coolant)
- 3 = EGR valve
- 4 = Vacuum accumulator
- 5 = Non-return valve
- 6 = Brake booster
- 7 = Vacuum pump
- 8 = Fuel-injection pump



460/2136

INSTALLATION POSITION OF COMPONENTS

- 1 = EGR valve
- 2 = Thermostat housing
- 3 = Pressure transformer
- 4 = Fuel-injection pump



460/2137

- 1 = Connection, intake end
- 2 = Connection, vacuum tester
- 3 = Vent

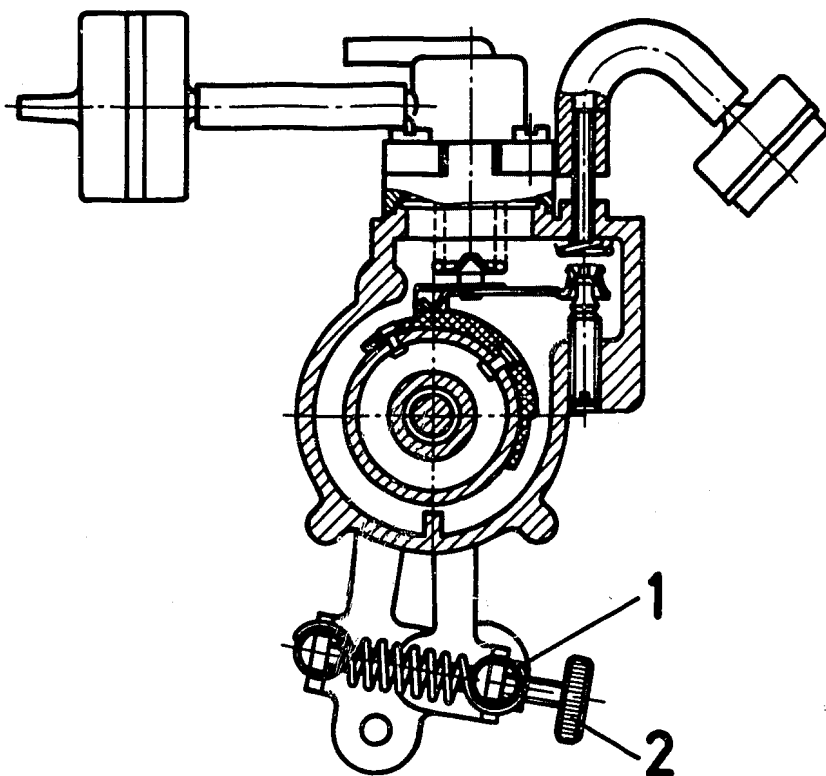
TESTING AND ADJUSTING EGR

Run engine at idle speed .

Set value: 700...750 min⁻¹

Connect vacuum tester with Y-distributor to connection 2 (mechanical pressure transformer) and read off vacuum value at idle speed.

Set value: approx. 420 hPa



460/2138

- 1 = Lock nut
- 2 = Plastic nut with headless set screw
(adjusting screw)

For production reasons:
continued on the following
coordinate.

Run engine at approx. 4500 min⁻¹ .

Set value, vacuum: approx. 180 hPa

If vacuum values are not attained, loosen lock nut
and turn plastic nut with headless set screw.

Tighten lock nut and repeat measurement.

Trouble-shooting instructions : POR-5015

BOSCH system : Tire check system RKS-G

Make of vehicle : PORSCHE

Basic microcard : KFZ-00.

TABLE OF CONTENTS

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SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of publication, apply to the following vehicle models:

* PORSCHE 928 08.88->

RKS-G system with self-diagnosis and 35-pole control-unit plug.

* The fault memory can be read out using the Pocket System Tester KTS 300 (0 684 400 300) with the program module PPG 204 as of status 25.09.1989.

Note:
Further diagnosis possibilities (actuator diagnosis etc), which would be feasible with newer program-module statuses, are not evaluated with these vehicles.

Pay attention to operating instructions for KTS 300. Connection of the KTS 300 to the diagnosis socket in the vehicle is via the adapter lead 1 684 465 192 PORSCHE.

* The self-diagnosis test table is arranged according to fault code nos. indicated by the KTS 300. The fault indication column sometimes includes two types of fault optionally indicated by the tester, e.g.:

Open circuit/ground short	(= 1st type of fault)
Short to B+	(= 2nd type of fault)

* As an alternative to the KTS 300, the fault memory can be read out with ON-BOARD diagnosis. With ON-BOARD diagnosis, RKS-G does not appear, but rather the Porsche designation RDK.

SPECIAL FEATURES (continued)

- * Self-diagnosis test table:
The KTS 300 display is presented in the first two columns.
Reference is made in the 3rd column to the coordinate of the rapid diagnosis chart with ON-BOARD diagnosis.

Important:

The self-diagnosis test table for the pocket system tester can only be used as of control-unit version R 02.

The version is displayed in the center field after calling up the ON-BOARD diagnosis.

Both the control-unit version R 00 and R 02 can appear in the self-diagnosis test table for ON-BOARD diagnosis. This has no influence on the test specifications.

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.

For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Identical test-step numbering makes it easier to find individual test steps in brief and basic instructions.

SAFETY AND PRECAUTIONARY MEASURES

- * The entire RKS-G must be tested after replacing the pressure switch, control unit (evaluation electronics), HF sensor and wiring harness as well as after performing work affecting the tire check system (e.g. wheel change or accident repair work).
- * Non-workmanlike replacement of the pressure switch can be fatal.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1.	RDK DEACTIVATED appears on display					
2.	At speeds less than 50 km/h TIRE PRESSURE appears on display with arrow pointing to arbitrary wheel					
3.	At speeds in excess of 50 km/h TIRE PRESSURE LOSS appears on display with flashing arrow at arbitrary wheel					
4.	RDK DEACTIVATED appears sporadically.					
5.	Warning lamp (indicator lamp) lights up all the time					
6.	Warning lamp lights up sporadically.					
Cause (component fault)						
X	X	X	X	X	X	Self-diagnosis
X				X		Control unit defective
X				X		Wheel-speed sensor 1)
X		X		X		High-frequency sensor 1)
X		X		X		Pressure switch 1)
X				X	X	Interface, instrument cluster
X				X		Warning lamp defective 1)
	X	X				Tire pressure too low
X	X	X	X	X	X	Read fault memory

1) Components are tested with actual-value list.

SELF-DIAGNOSIS TEST TABLE

Pocket system tester Fault indication	Fault code	Coordinate
High-frequency sensor rear left Ground short	1	A11
High-frequency sensor rear right Ground short	2	A11
High-frequency sensor front left Ground short	3	A11
High-frequency sensor front right Ground short	4	A11
High-frequency sensor rear left Op. circ./sh. to B+	1	A11
High-frequency sensor rear right Op. circ./sh. to B+	2	A11
High-frequency sensor front left Op. circ./sh. to B+	3	A11
High-frequency sensor front right Op. circ./sh. to B+	4	A11

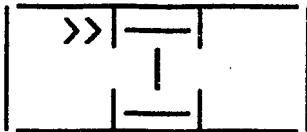
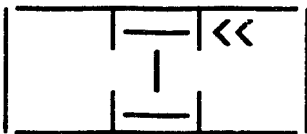
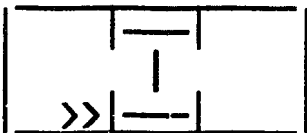
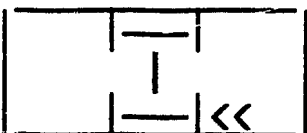
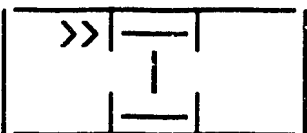

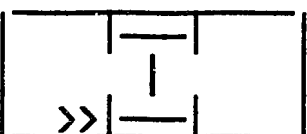
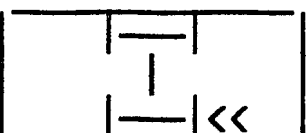

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Pocket system tester Fault indication	Fault code	Coordinate
High-frequency sensor rear left Signal error	1	A11
High-frequency sensor rear right Signal error	2	A11
High-frequency sensor front left Signal error	3	A11
High-frequency sensor front right Signal error	4	A11
Wheel-speed sensor rear left Open circuit	5	A13
Wheel-speed sensor rear right Open circuit	6	A13
Wheel-speed sensor front left Open circuit	7	A13
Wheel-speed sensor front right Open circuit	8	A13

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Pocket system tester Fault indication	Fault code	Coordinate
Wheel-speed sensor rear left Signal error	5	A13
Wheel-speed sensor rear right Signal error	6	A13
Wheel-speed sensor front left Signal error	7	A13
Wheel-speed sensor front right Signal error	8	A13
Warning lamp Short to B+	9	A13
Warning lamp Open circuit	9	A13
Control unit Digital sec.(comput) defective	17	A15
Interface Instrument cluster defective	18	A15
Battery voltage too low	19	A15

For production reasons:
continued on the following
coordinate.

Fault indication on instrument cluster			Test instructions/test conditions	
TIRE		PRESSURE	FL arrow lights up all the time	<p>A wheel arrow lights up all the time if a pressure switch indicates a tire pressure loss.</p> <p>Increase tire pressure by approx. 200 mbar.</p> <p>Increase pressure at other tire on same axle to same value.</p> <p>The display must go out following brief check drive (at least 20 m) at > 5 km/h.</p>
TIRE		PRESSURE	FR arrow lights up all the time	
TIRE		PRESSURE	RL arrow lights up all the time	
TIRE		PRESSURE	RR arrow lights up all the time	
TIRE		PRESSURE LOSS	FL arrow flashes	<p>If arrow flashes, proceed in exactly the same manner as when arrow lights up constantly.</p> <p>Repeat process until alarm is no longer given.</p> <p>A tire pressure of max. 3.5 bar at the front axle and 4.0 bar at the rear axle must not be exceeded.</p> <p>If the display does not go out, release air at both pressure switches until display RDK DEACTIVATED appears.</p>
TIRE		PRESSURE LOSS	FR arrow flashes	
TIRE		PRESSURE LOSS	RL arrow flashes	
TIRE		PRESSURE LOSS	RR arrow flashes	
RDK		DEACTIVATED	Read and evaluate fault memory	

SELF-DIAGNOSIS TEST TABLE FOR ON-BOARD DIAGNOSIS
Version RR 00 / R 02

Fault ind. on instr. cluster			Test instructions/Test conditions	Termin-als	Set values
Fault code	Fault location	Distinc-tion			
01/104 01/ 40 01/ 98 01/ 34 01/100 01/ 36	HF sensor RL " " " " "	sporadic current sporadic current sporadic current	Plausibility (level error) Plausibility (level error) Use ohmmeter to check lead from CU plug term. 34 to vehicle ground term. 13 for short to ground. Use ohmmeter to check for open circuit in lead from CU plug term. 34 to HF sensor.	34...13	0,88...0,94 0,64...0,76 > 100 k Ω approx. 0 Ω
02/104 02/ 40 02/ 98 02/ 34 02/100 02/ 36	HF sensor RR " " " " "	sporadic current sporadic current sporadic current	Plausibility (level error) Plausibility (level error) Use ohmmeter to check lead from CU plug term. 17 to vehicle ground term. 13 for short to ground. Use ohmmeter to check lead from CU plug term. 17 to HF-sensor for open circuit.	17...13	0,88...0,94 0,64...0,76 > 100 k Ω approx. 0 Ω
03/104 03/ 40 03/ 98 03/ 34 03/100 03/ 36	HF sensor FL " " " " "	sporadic current sporadic current sporadic current	Plausibility (level error) Plausibility (level error) Use ohmmeter to check lead from CU plug term. 35 to vehicle ground term. 13 for short to ground. Use ohmmeter to check lead from CU plug term. 35 to HF-sensor for open circuit.	35...13	0,88...0,94 0,64...0,76 > 100 k Ω approx. 0 Ω
04/104 04/ 40 04/ 98 04/34 04/100 04/ 36	HF sensor FR " " " " "	sporadic current sporadic current sporadic current	Plausibility (level error) Plausibility (level error) Use ohmmeter to check lead from CU plug term. 18 to vehicle ground term. 13 for short to ground. Use ohmmeter to check lead from CU plug term. 18 to HF-sensor for open circuit.	18...13	0,88...0,94 0,64...0,76 > 100 k Ω approx. 0 Ω

SELF-DIAGNOSIS TEST TABLE FOR ON-BOARD DIAGNOSIS (CONTINUED)

Version RR 00 / R 02

Fault ind. on instr. cluster			Test instructions/Test conditions	Termin- als	Set values
Fault code	Fault location	Distinc- tion			
05/104	Wheel-speed sensor RL	sporadic current	Air gap between wheel-speed sensor RL and ring gear too large. Ring gear defective, loose or wrong number of teeth. Check leads of wheel-speed sensors from RKS-G control unit term. 26 to ABS controller term. 30 for open circuit.	RKS-G/ABS	45 teeth
05/ 40	"	sporadic		26...30	approx. 0 Ω
05/100	"	current			
05/ 36					
06/104	Wheel-speed sensor RR	sporadic current	Air gap between wheel-speed sensor RR and ring gear too large. Ring gear defective, loose or wrong number of teeth. Check leads of wheel-speed sensors from RKS-G control unit term. 8 to ABS controller term. 31 for open circuit.	RKS-G/ABS	45 teeth
06/ 40	"	sporadic		8...31	0 Ω
06/100	"	current			
06/ 36					
07/104	Wheel-speed sensor FL	sporadic current	Air gap between wheel-speed sensor FL and ring gear too large. Ring gear defective, loose or wrong number of teeth Check leads of wheel-speed sensors from RKS-G control unit term. 29 to ABS controller term. 17 for open circuit.	RKS-G/ABS	45 teeth
07/ 40	"	sporadic		29...17	approx. 0 Ω
07/100	"	current			
07/ 36					
08/104	Wheel-speed sensor FR	sporadic current	Air gap between wheel-speed sensor FR and ring gear too large. Ring gear defective, loose or wrong number of teeth. Check leads of wheel-speed sensors from RKS-G control unit term. 28 to ABS controller term. 23 for open circuit.	RKS-G/ABS	45 teeth
08/ 40	"	sporadic		28...23	aprox. 0 Ω
08/100	"	current			
08/ 36					
09/ 97	Warning lamp in instru- ment cluster (indicator lamp)	sporadic	Replace warning lamp, lamp does not light up following "ignition on", remove lamp. Use voltmeter to take measure- ment with detached control unit at CU plug at term.3. Use ohmmeter to measure lead from CU plug term. 3 to indicator lamp for open circuit.	3...13	approx. 0 V
09/ 33		current			approx. 0 Ω
09/100		sporadic			
09/ 36		current			

SELF-DIAGNOSIS TEST TABLE FOR ON-BOARD DIAGNOSIS (CONTINUED)
Version RR 00 / R 02

Fault ind. on instr. cluster			Test instructions/Test conditions	Term- inals	Set values
Fault code	Fault location	Distinc- tion			
17/ 00	Control unit	———	Not yet functional	———	———
18/100 20	Serial interface	sporadic current	Use voltmeter to measure instrument cluster voltage at CU plug term. 19...13 and term. 18/ 36. Caution: Initiation of stimulation may also cause the fault 18 to be stored in the fault memory.	RKS-G/DIAG 19 20...13	approx. U Batt. approx. U Batt.
19/ 00	Battery	———	U B < 8 V	33...13	approx. U Batt.

Fault indication on instrument cluster	Test instructions/Test conditions	Term- inals	Set values
CLEAR MEMORY R00	If yes, press steering-column lever down for 3 seconds. If no, move steering-column lever upwards.	———	———
ACTUATE ACTUATORS R00 ?	No function/pull steering-column lever to effect switching to sensor display.	———	———

SELF-DIAGNOSIS TEST TABLE FOR ON-BOARD DIAGNOSIS (ACTUAL-VALUE LIST)

Version R R 00 / R 02

Fault ind. on instr. cluster (Actual values)	Test instructions/Test conditions		Term- inals	Set values
TEST SENSORS R 00 ?	If yes, pull steering-column lever. If no, move steering-column lever upwards.			
SENSOR 01 R 00	Note down values	Divide value read off from sensor 01 by value read off from sensor 10		88...94 % 64...74 %
SENSOR 02 R 00	Note down values	Divide value read off from sensor 02 by value read off from sensor 10		88...94 % 64...74 %
SENSOR 03 R 00	Note down values	Divide value read off from sensor 03 by value read off from sensor 10		88...94 % 64...74 %
SENSOR 04 R 00	Note down values	Divide value read off from sensor 04 by value read off from sensor 10		88...94 % 64...74 %

SELF-DIAGNOSIS TEST TABLE FOR ON-BOARD DIAGNOSIS (ACTUAL-VALUE LIST CONTINUED)
Version R R 00 / R 02

Fault ind. on instr. cluster	Test instructions/Test conditions	Term- inals	Set values
SENSOR 05 R 00	Vehicle at a standstill Move vehicle at 10 km/h		00 07-09
SENSOR 06 R 00	Vehicle at a standstill Move vehicle at 10 km/h		00 07-09
SENSOR 07 R 00	Vehicle at a standstill Move vehicle at 10 km/h		00 07-09
SENSOR 08 R 00	Vehicle at a standstill Move vehicle at 10 km/h		00 07-09
SENSOR 09 R 00	A decimal value appears on the display (no significance)	—	—
SENSOR 10 R 00	A decimal value appears on the display Required for sensor testing 01 ... 04.		91...181
SENSOR 11 R 00	Indicator lamp lights up Indicator lamp off		0... 3 250...255
SENSOR 12 R 00	A decimal value appears on the display (no significance)	—	—

SELF-DIAGNOSIS TEST TABLE FOR ON-BOARD DIAGNOSIS (ACTUAL-VALUE LIST CONTINUED)
Version R R 00 / R 02

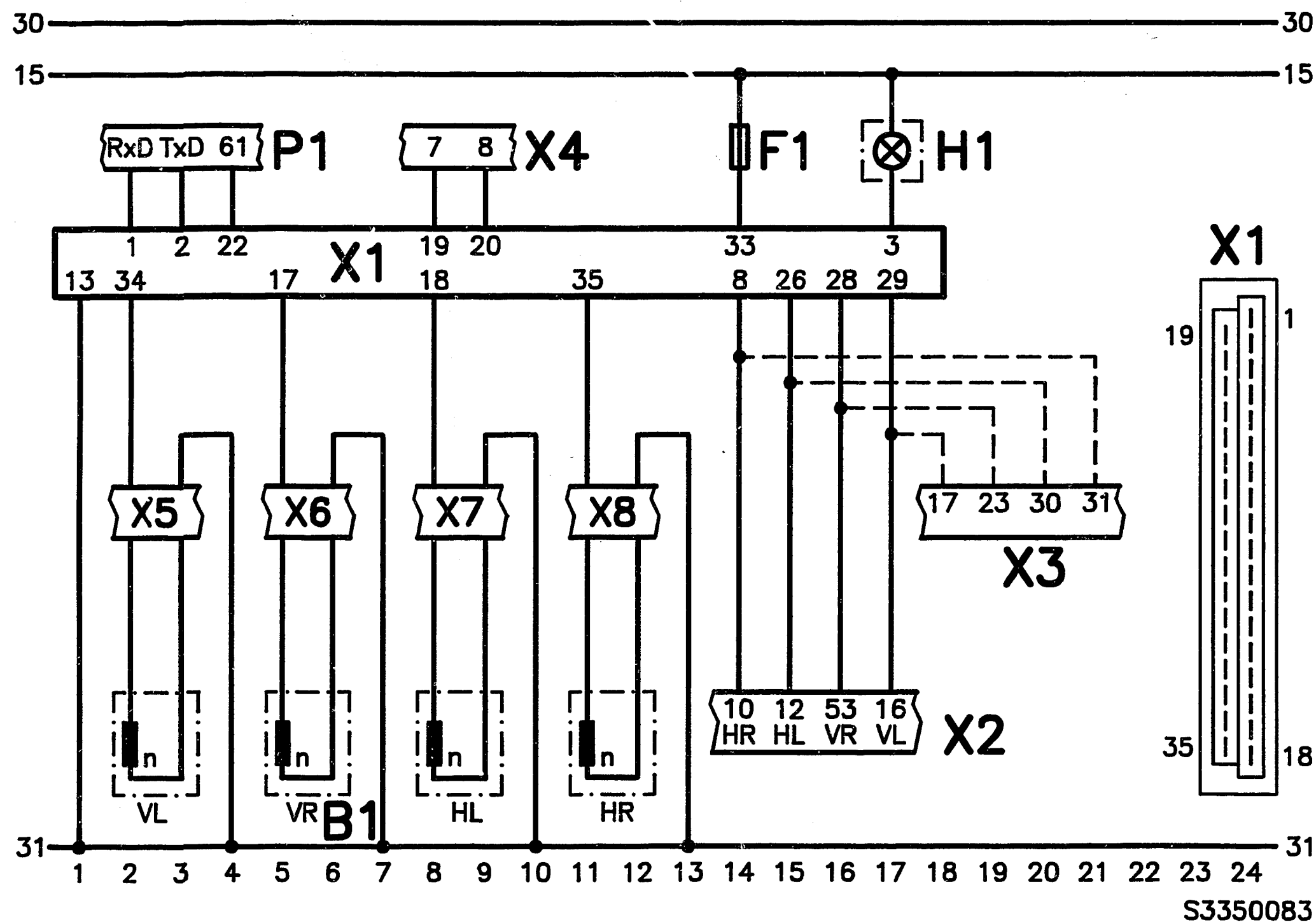
Fault ind. on instr. cluster	Test instructions/Test conditions	Terminals	Set values
TEST SWITCH 00 R ?	If yes, pull steering-column lever. If no, move steering-column lever upwards.		
SWITCH 01 R 00	Turn corresponding wheel until one of the two pressure switches in the rim is over the high-frequency sensor.		OPEN CLOSED
SWITCH 02 R 00	If CLOSED appears, position other pressure switch in rim over high-frequency sensor.		OPEN CLOSED
SWITCH 03 R 00	If pressure switch is over high-frequency sensor and CLOSED does not appear, check tire pressure.		OPEN CLOSED
Switch 04 R 00	In the event of correct tire pressure, replace the pressure switch concerned.		OPEN CLOSED
PERFORM SF R 00 ?	Not assigned		

A test drive is to be performed after reading out the fault memory and clearing the faults.

TEST SPECIFICATIONS

Tightening torque for pressure sensor	20 Nm
Tightening torque for HF-sensor fastening screws	4,1...5,5 Nm
Tire pressure, front axle at 20°C	2,5 bar
rear axle at 20°C	3,0 bar
HF-sensor resistance value	4,75...5,25 k Ω
Wheel-speed sensor	600...1600 Ω
HF-sensor current consumption attenuated	15...20 mA
non-attenuated	2...3 mA

For production reasons:
continued on the following
coordinate.



ELECTRICAL TERMINAL DIAGRAM

B1 = High-frequency sensor
H1 = RKS-G warning lamp
P1 = Instrument cluster

X1 = Control-unit plug RKS-G (35-pole)
X2 = Control-unit plug ABS (55-pole)
X3 = Control-unit plug ABS (35-pole)
X4 = Diagnosis socket
X5-X8 = Multiple butt connectors, high-frequency sensor

FL = Front left
FR = Front right
RL = Rear left
RR = Rear right

INSTALLATION POSITION OF COMPONENTS

Removal and installation instructions

Front axle: (top picture)

Rear axle: similar

Pressure-switch removal:

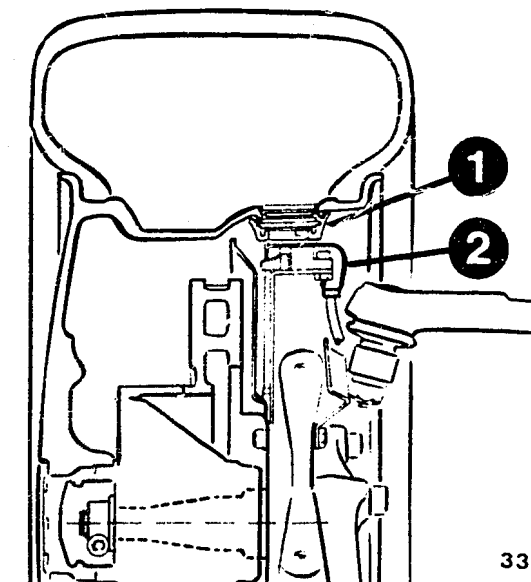
- * Remove tire and then remove deflector (arrow, bottom picture) over pressure switch.
Caution: When removing tire, do not position pressing-off device of tire-mounting device in area of pressure switches (press off with 90° offset).
- * Disassemble pressure switch using customer service tools KDES 0013 and KDES 0014.

The following is to be noted when installing a pressure switch:

- * Grease O-ring with vaseline.
- * O-ring is not to be pulled over sharp edges (threads, grooves, corners etc.). Only the mounting sleeve KDES 0015 is to be used for attaching the O-ring to the pressure switch. The O-ring must not be positioned in the mounting groove such that it is pinched or twisted.
- * Insert pressure switch in rim on correct side (see top picture).
Attach pin-type socket wrench KDES 0013 to pressure switch and hold it in position. Tighten fastening nut of pressure switch with socket wrench KDES 0014. Tightening torque 20...25 Nm.

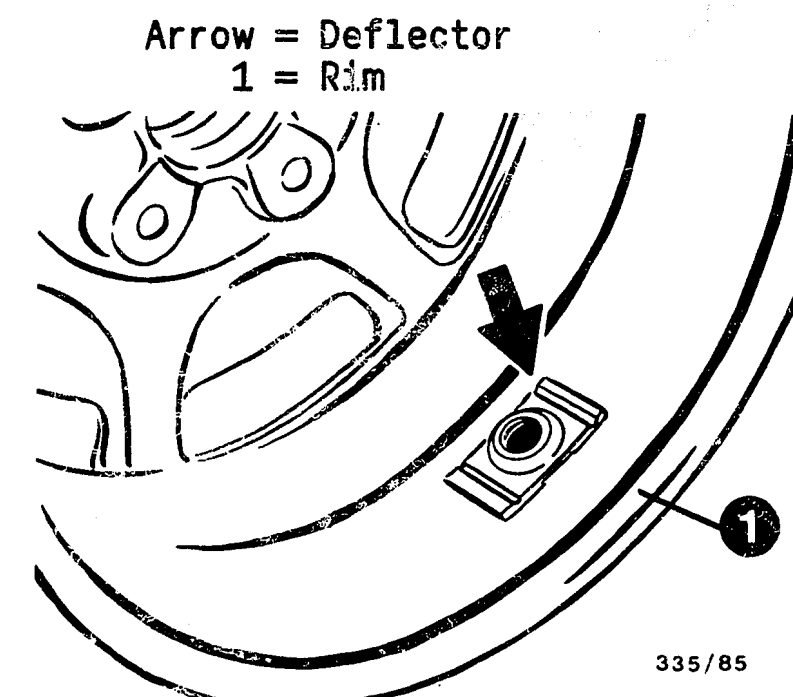
HF - sensor disassembly:

- * Loosen and remove two fastening screws.
- * Release triple plug connection and pull out HF sensor plug.
- * Install new HF-sensor in reverse order.



335/84

1 = Pressure switch
2 = HF sensor

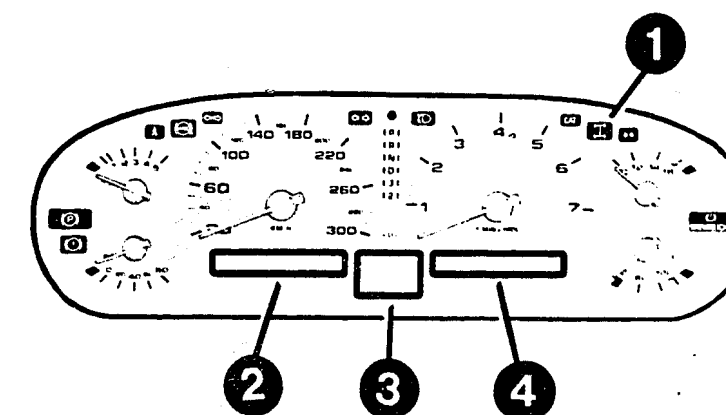


335/85

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Instrument cluster: top picture

- 1 = RKS-G warning lamp
- 2 = Left-hand display panel
- 3 = Center display panel (Pictogram)
- 4 = Right-hand display panel

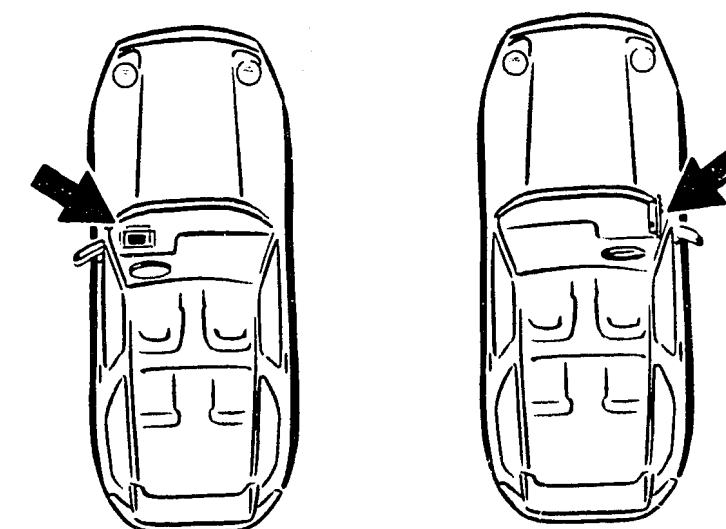


335 / 86

Control unit: Center picture

On LHD vehicles in driver's footwell at lower section of instrument panel, left.

On RHD vehicles in driver's footwell at right-hand side wall.

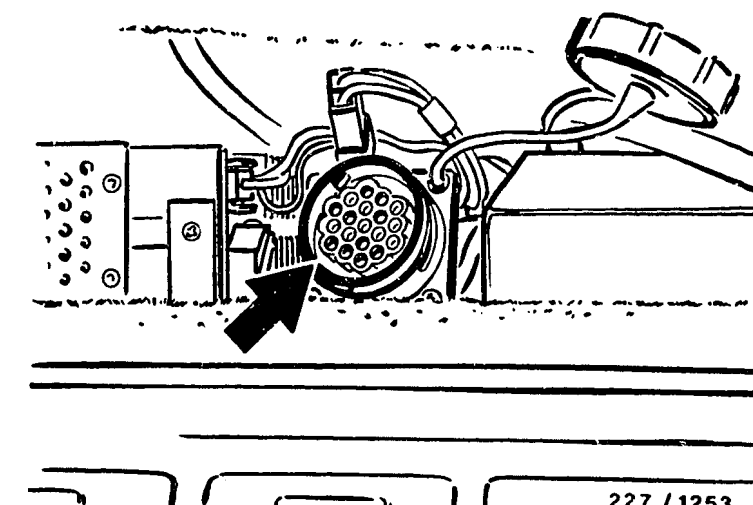


335 / 87

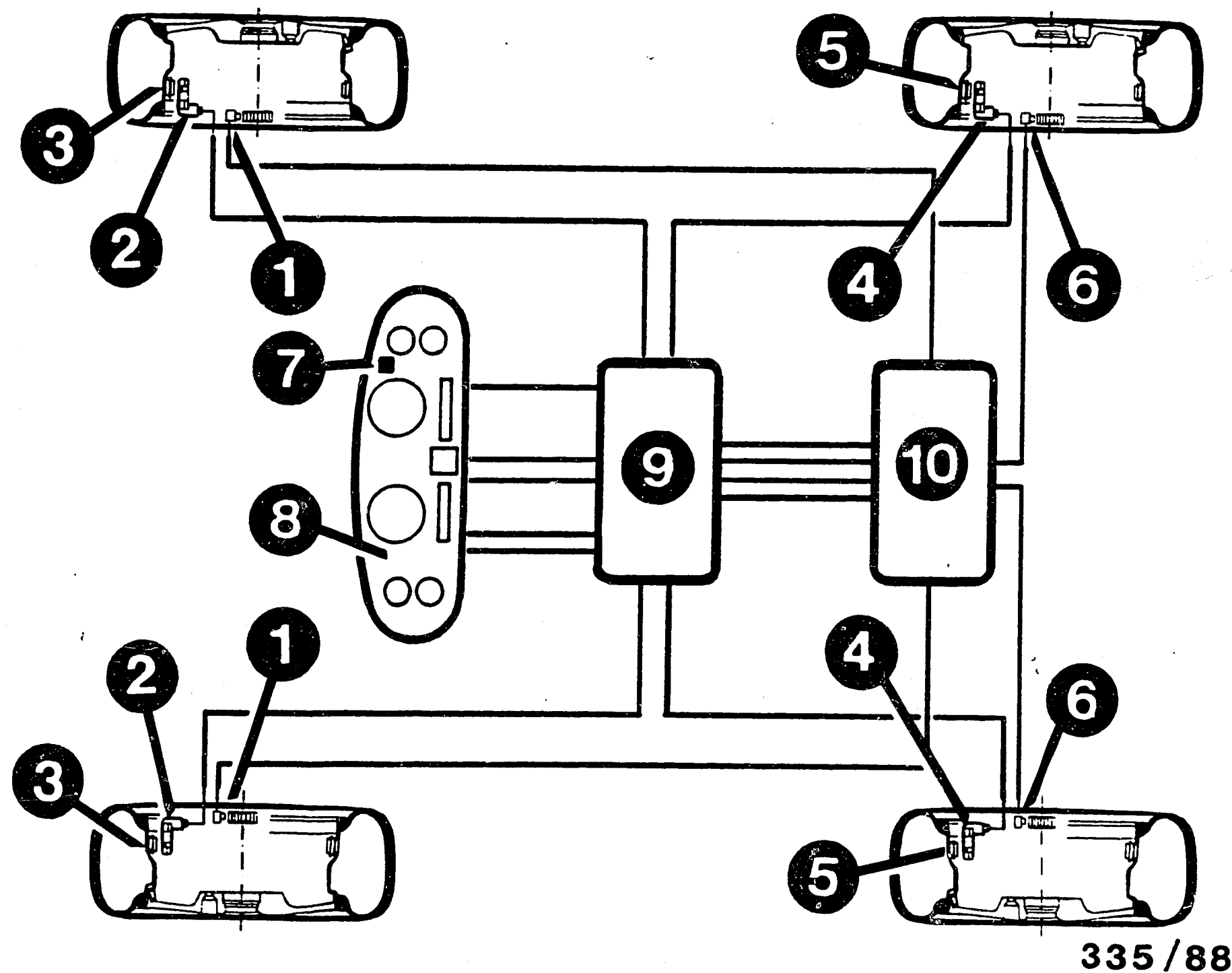
Diagnosis socket: bottom picture

On right next to passenger's seat beneath a cover.

Cover is secured with two knurled screws which can be unscrewed by hand.



227 / 1253



INSTALLATION POSITION OF COMPONENTS (CONTINUED)

- 1 = Wheel-speed sensor, front axle
- 2 = High-frequency sensor, front axle
- 3 = Pressure switch, front axle
- 4 = High-frequency sensor, rear axle
- 5 = Pressure switch, rear axle

- 6 = Wheel-speed sensor, rear axle
- 7 = Warning lamp
- 8 = Instrument cluster
- 9 = RKS-G control unit
- 10 = ABS controller

Trouble-shooting instructions : VWW-5013
BOSCH system : VE pump VE..E..
Make of vehicle : VW
Basic microcard : see KFZ 00..

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SPECIAL FEATURES

These brief instructions, valid at the time of publication, apply to the following VW / AUDI models:

* Engine: 1.6 L Code letters RA : 59 kW
JR/MF: 51 kW
* Engine: 1.3 L : 33 kW

Note on engine 1.6 L:

The fuel-injection system differs as follows from that of the 1.6 L engine:

- Idle increase coupled with timing device KSB
- Mechanical power on/off damper
- Spring-actuated power on/off damper

STRUCTURE, USAGE

These brief instructions essentially comprise vehicle-specific special features and test specifications (set values).

In line with the customer complaint, the trouble-shooting chart indicates various causes/component faults.

Detailed information on trouble-shooting can be obtained from the trouble-shooting chart in the basic instructions.

NOTE:

The set values and special features in these vehicle-related brief instructions are always binding even if reference is made to basic instructions.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)									
1.									Starting motor operates, engine fails to start or starts only with difficulty (warm and cold)
2.									Engine hunts when idling/engine speed too high
3.									Rough idling with warm engine
4.									High fuel consumption in conjunction with inadequate engine power and formation of smoke
5.									Inadequate performance
6.									Black fumes in full-load range in conjunction with hard engine running, possible loss of power
7.									Hard engine running
Cause (component fault)									
*	*				*				Tank empty, tank ventilation
*		*							Injection sequence not firing sequence
	*				*				Inlet/return hollow screws
*									Shutoff device
		*			*				Air in fuel system
	*								Paraffin separation
									Leak in fuel lines
*					*				Fuel lines clogged
*					*				Supply lines clogged
					*				Engine air filter
		*							Idle speed
	*								Residual-quantity setting
*		*			*		*		Injection nozzle

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)									
1.									Starting motor operates, engine fails to start or starts only with difficulty (warm and cold)
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4.									High fuel consumption in conjunction with inadequate engine power and smoke formation
5.									Inadequate performance
6.									Black fumes in full-load range in conjunction with hard engine running, possible loss of power
7.									Hard engine running
Cause (component fault)									
*									Glow plug system
*					*				Fuel filter
					*	*	*		Timing device
*		*							Engine compression
					*	*	*	*	Pump – engine assignment
					*	*	*		Engine management

TROUBLE-SHOOTING CHART (continued)

Customer complaint (fault symptoms)

8. Engine misfires when driving

9. Engine cannot be shut off

10. Incorrect engine speeds

11. Engine won't rev up when cold

12. High idle or rough engine running at high engine speed, poor throttle take-up

13. Black fumes in full-load range

14. White fumes in full-load range

Cause (component fault)

*						Tank empty, tank ventilation
*						Injection sequence not firing sequence
*						Inlet/return hollow screws
*	*					Shutoff device
*						Air in fuel system
*						Paraffin separation
*						Leak in fuel lines
*						Fuel lines clogged
*						Supply lines clogged
				*		Engine air filter
	*					Idle speed
			*			Residual-quantity setting
*						Injection nozzle

TROUBLE-SHOOTING CHART (continued)

Customer complaint (fault symptoms)

8. Engine misfires when driving

9. Engine cannot be shut off

10. Incorrect engine speeds

11. Engine won't rev up when cold

12. High idle or rough engine running at high engine speed

13. Black fumes in full-load range

14. White fumes in full-load range

Cause (component fault)

*						Fuel filter
				*		Timing device
		*				Engine compression
		*		*		Pump - engine assignment
*						Engine management

TEST SPECIFICATIONS Engine 1.6 L

Idle speed:

Audi 80/Audi 90 as of model 87

Naturally aspirated engine	850...900 min ⁻¹
Turbo Diesel	920...980 min ⁻¹
Turbo Diesel with charge cooling Code letters "RA"	870...930 min ⁻¹

VW Passat as of model 88

Turbo Diesel	870...930 min ⁻¹
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Nozzle-opening pressure:

- New nozzles	155...163 bar
- Wear limit	140 bar

Pump - engine assignment:

Setting:

* Engine setting TDC:	Cyl. no. 1
* Pump setting after BDC:	0.98...1.02 mm

Test specification:

* Engine setting TDC:	Cyl. no. 1
* Pump setting after BDC:	0.93...1.07 mm

Toothed belt tension

Scale value	12...13
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Charge-air pressure:

0.64...0.76 bar

Blow-off-valve pressure

0.81...0.86 bar

TEST SPECIFICATIONS (CONTINUED) Engine 1.3 L

Idle speed:

Polo as of model 87

Naturally aspirated diesel	850...950 min ⁻¹
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Nozzle-opening pressure:

- New nozzles	130...138 bar
- Wear limit	120 bar

Pump - engine assignment:

Setting:

* Engine setting TDC:	Cyl. no. 1
* Pump setting after BDC:	1.03...1.07 mm

Test specification:

* Engine setting TDC:	Cyl. no 1
* Pump setting after BDC:	0.98...1.12 mm

Compression:

- New	34 bar
- Wear limit:	25 bar
- Max. perm. pressure difference:	5 bar

Toothed belt tension:

* Crankshaft sprocket, camshaft sprocket and coolant pump impeller
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Scale value:

17...18

Tension by turning coolant pump.

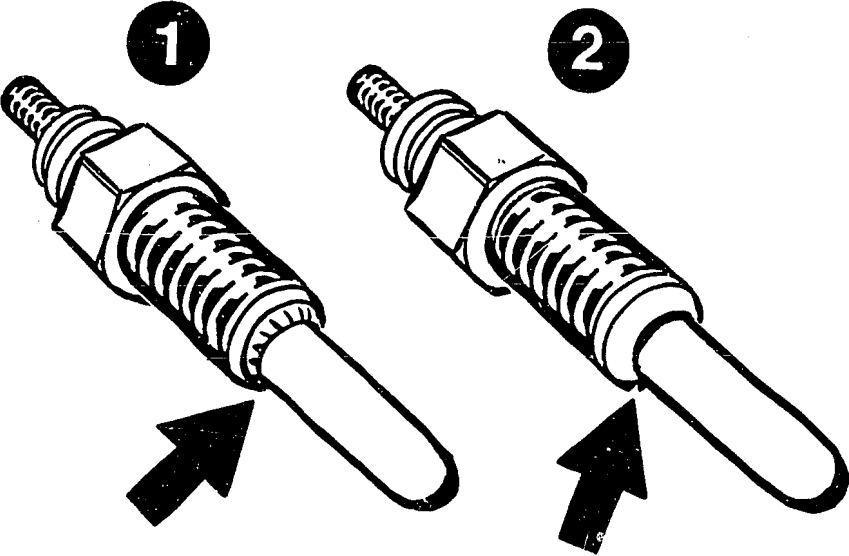
TIGHTENING TORQUES

Engine 1.6 L

Camshaft sprocket	45 Nm
Injection pump impeller	45 Nm
Fuel lines	25 Nm
Fuel-injection-pump fastening screws ..	25 Nm
Sheathed-element glow plugs (with and without annular orifice):	
Thread M 12 x 1.25	15...25 Nm
Thread M 12 x 1	10...15 Nm
Connecting thread, sheathed-element glow plugs:	
Thread M5	5 Nm
Thread M4	2.5 Nm

Engine 1.3 L

Injection pump impeller	45 Nm
Driving gear for fuel-injection pump .	100 Nm
Fastening screw	
Toothed belt sprocket	90 Nm
Camshaft sprocket	45 Nm
Fuel-injection tubing	25 Nm
Injection nozzles	70 Nm
Fastening screws	
Fuel-injection pump	25 Nm
Bleeder screw	15 Nm



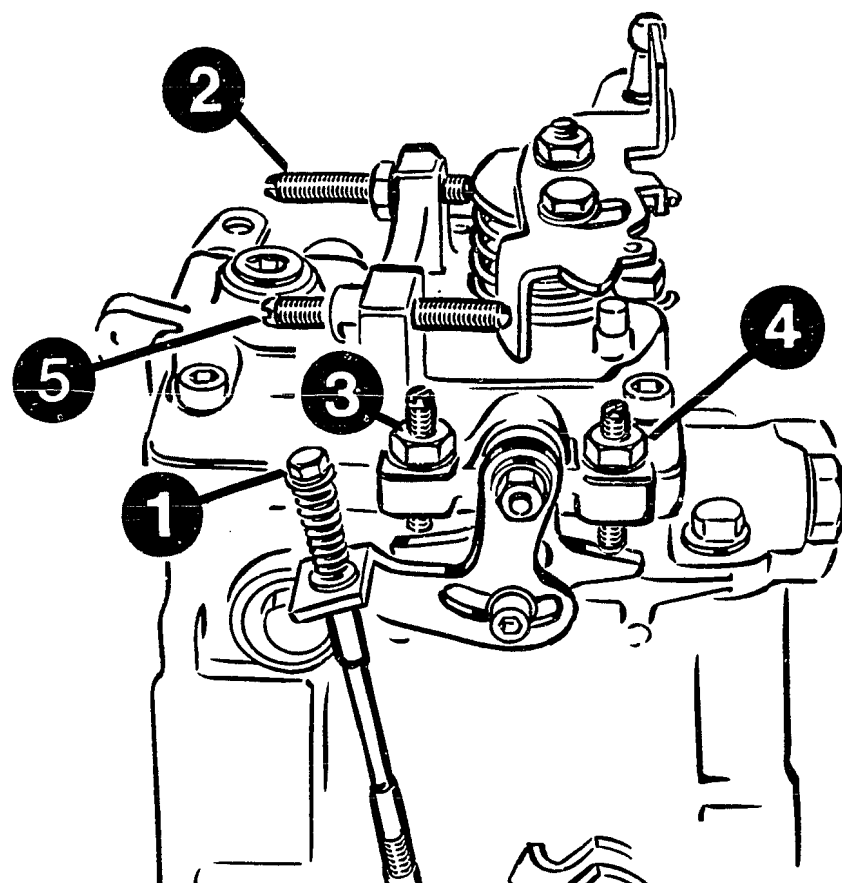
460/2122

- 1 = Annular orifice approx. 0.5 mm
2 = Annular orifice closed

NOTE ON SHEATHED-ELEMENT GLOW PLUGS:

The tightening torque for the sheathed-element glow plugs must not be exceeded, since otherwise the annular orifice between glow bar and thread section is closed (arrows).

A closed annular orifice results in premature failure of the sheathed-element glow plugs.
(Temperature increase due to short-circuit)



460 / 2123

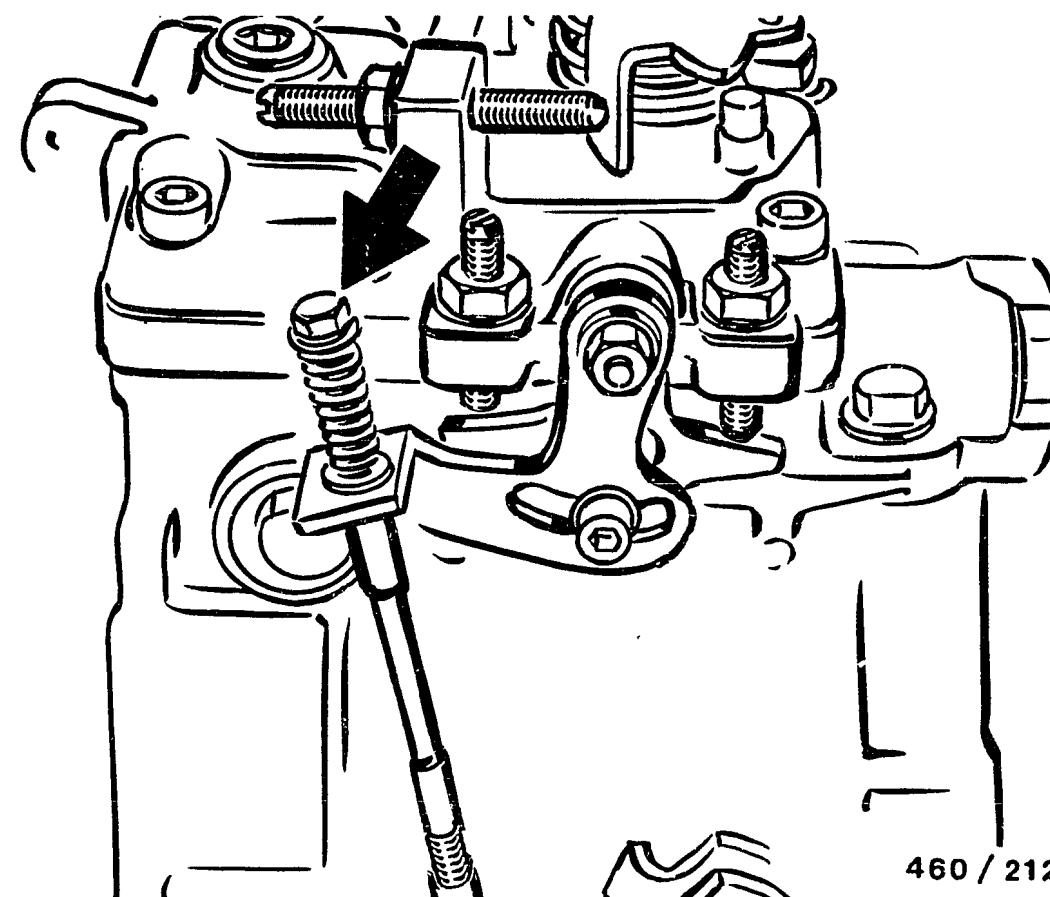
- 1 = Idle-speed adjusting screw
- 2 = Rated-speed adjusting screw
- 3 = Stop screw for low idle
- 4 = Stop screw for high idle (speed increase)
- 5 = Residual-quantity adjusting screw

TESTING IDLE SPEED AND SPEED INCREASE

Engine 1.6 L

Testing and adjustment conditions:

- * Engine oil temperature min. 60° C
- * Cable of cold-start accelerator must not have been pulled.
- * Electrical loads off



460 / 2124

TESTING IDLE SPEED

Engine 1.6 L

Start engine and run it at idle speed.

Set engine speed at idle-speed adjusting screw (arrow).

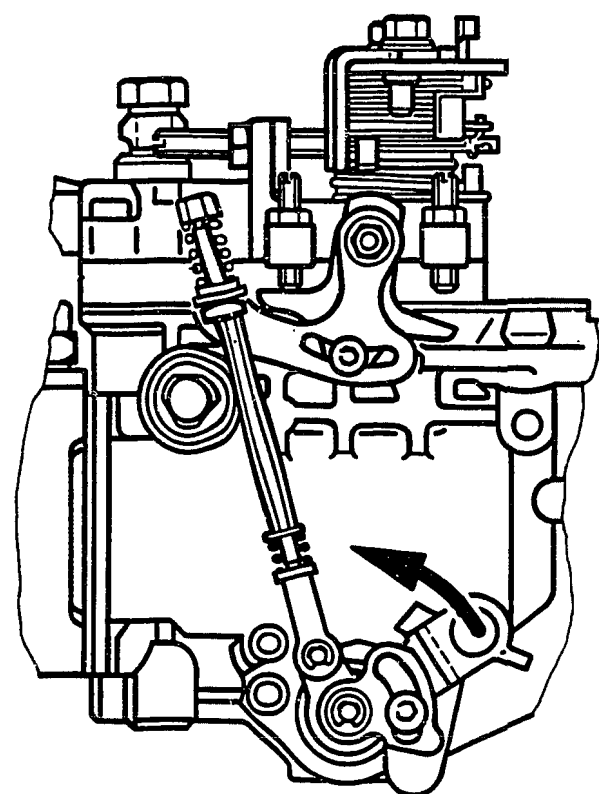
Idle speeds, engine 1.6 L:

Audi 80/Audi 90 as of model 87

Naturally aspirated diesel	850...900 min ⁻¹
Turbo Diesel	920...980 min ⁻¹
Turbo Diesel with charge cooling Code letters "RA"	870...930 min ⁻¹

VW Passat as of model 88

Turbo Diesel	870...930 min ⁻¹
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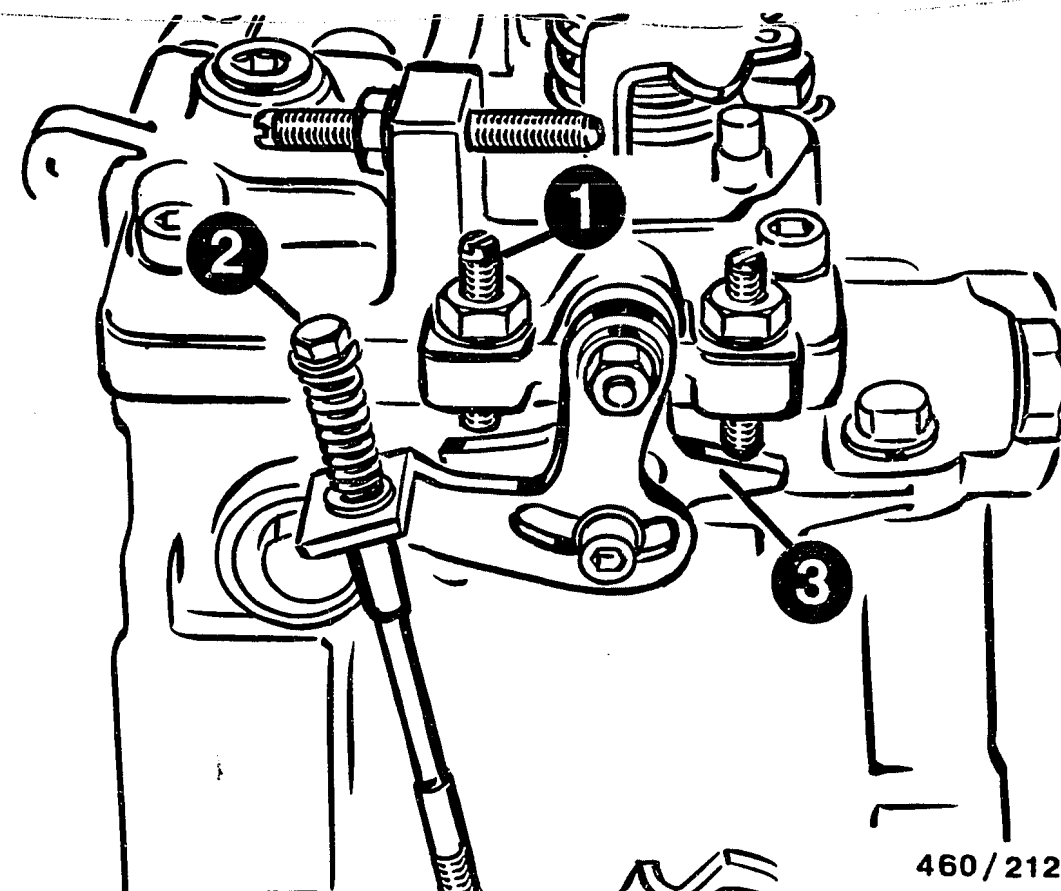
460/1508

TESTING SPEED INCREASE

The speed increases by approx. 60 min⁻¹ on 1st-stage actuation of cold-start accelerator (KSB)

The speed must increase to 1000...1100 min⁻¹ with KSB completely pulled.

If the idle speed cannot be adjusted as described, since the LFG stop lever is in contact with the idle stop screw, or if the high idle speed is not correct, basic adjustment is to be performed.



460/2125

- 1 = Idle stop screw
- 2 = Idle-speed adjusting screw
- 3 = LFG stop lever

ADJUSTING IDLE SPEED

* LFG stop lever is in contact with idle stop screw.

Turn back idle stop screw.

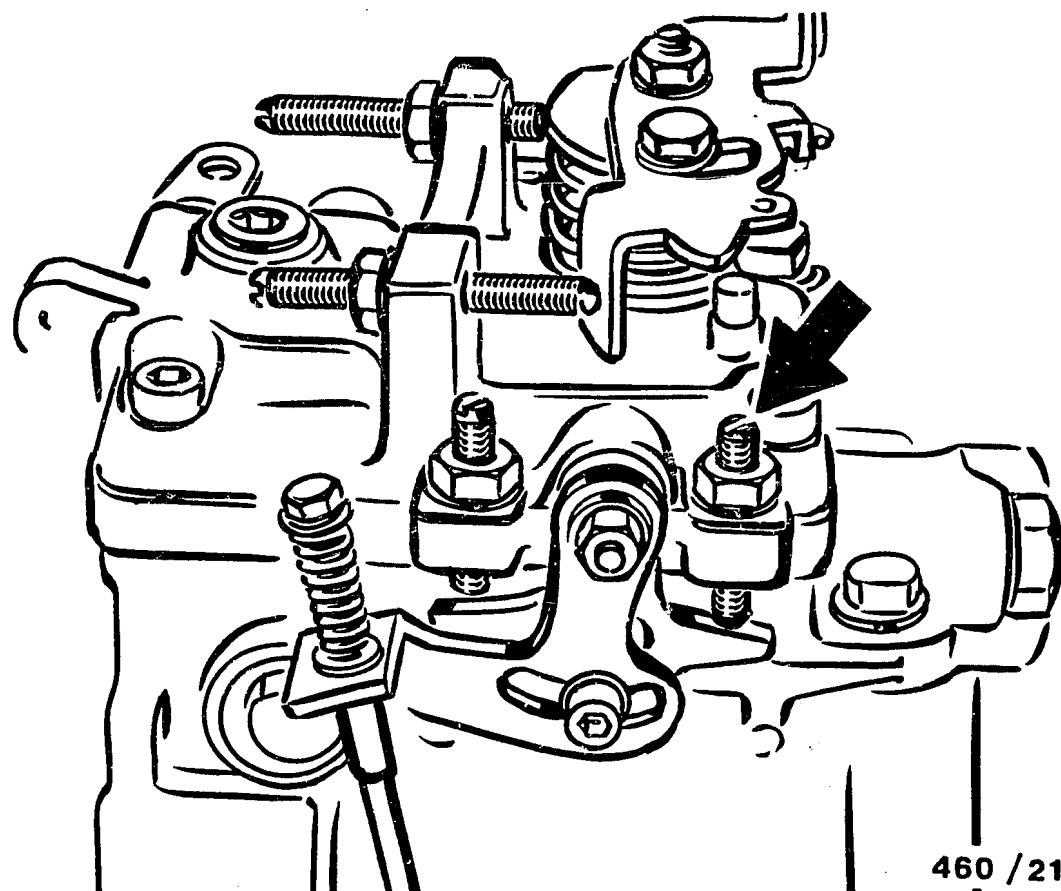
Set idle speed at adjusting screw by turning linkage.

Idle speeds, engine 1.6 L:
Audi 80/Audi 90 as of Model 87

Naturally aspirated diesel	850...900 min ⁻¹
Turbo Diesel	920...980 min ⁻¹
Turbo Diesel with charge cooling	Code letters "RA" 870...930 min ⁻¹

VW Passat as of model 88

Turbo Diesel 870...930 min⁻¹
Position idle stop screw such that it is in contact with LFG stop lever and lock.



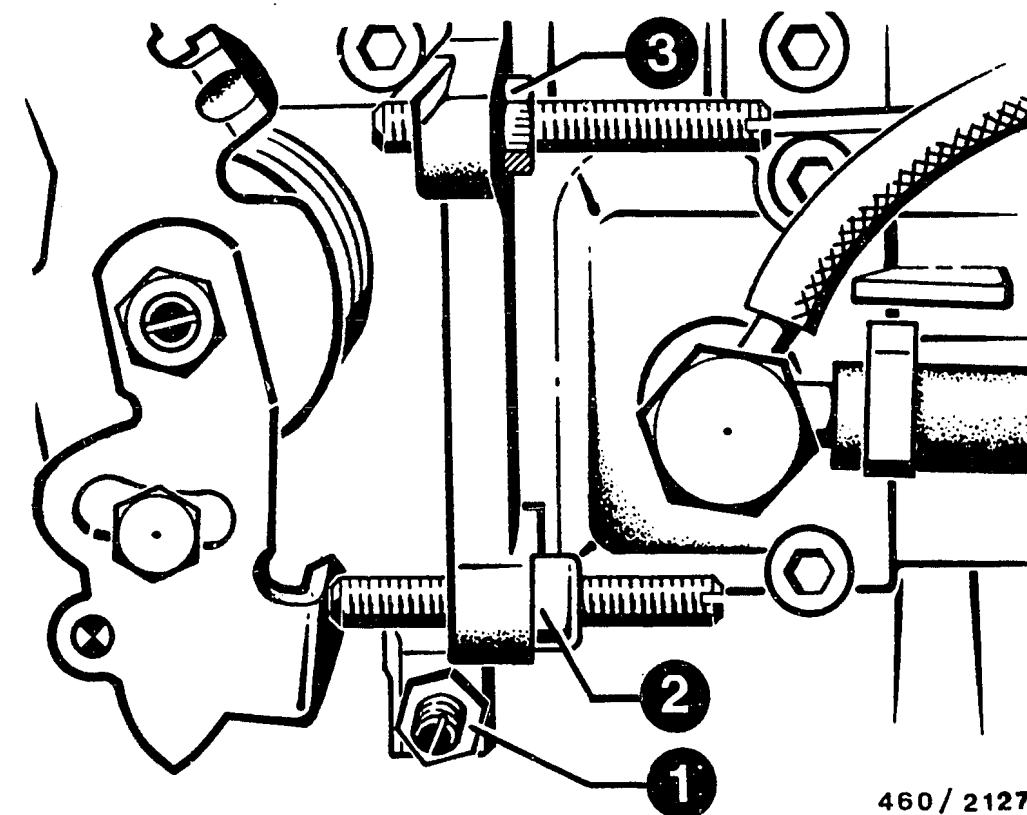
460 / 2126

Arrow = Stop screw for high idle

SETTING SPEED INCREASE

Loosen stop screw for high idle.

With KSB cable completely pulled out, set high idle to 1050 min⁻¹ by turning stop screw.



460 / 2127

- 1 = Idle-speed adjusting screw
- 2 = Residual-quantity adjusting screw
- 3 = Rated-speed adjusting screw

TESTING AND ADJUSTING IDLE SPEED

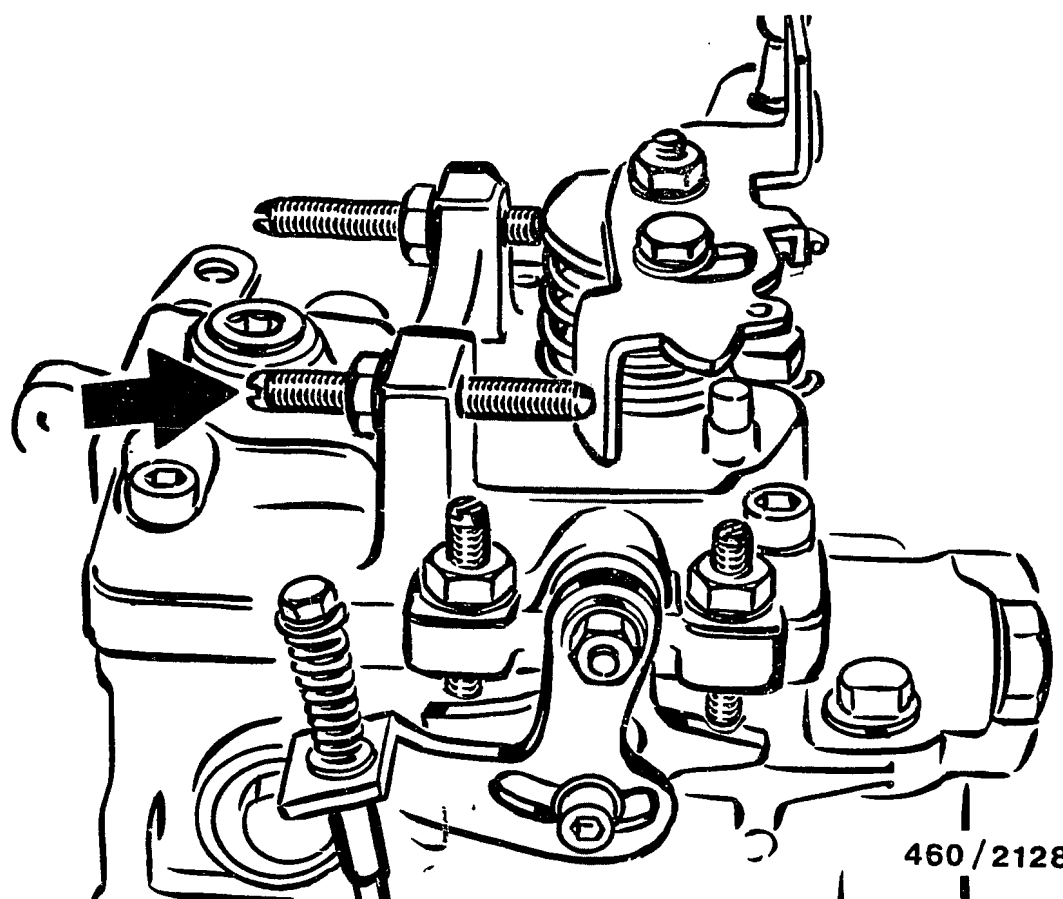
Engine 1.3 L

Testing and adjustment conditions:

- * Engine oil temperature min. 60° C
- * Cable of cold-start accelerator must not have been pulled.
- * Electrical loads off

Start engine and run it at idle speed.
Set engine speed at idle-speed adjusting screw.

Idle speed:
Naturally aspirated diesel 850...950 min⁻¹



Arrow = Residual-quantity adjusting screw

TESTING AND ADJUSTING RESIDUAL QUANTITY

The residual-quantity adjusting screw is secured with a cap and is not normally to be adjusted.

The following "complaints" may be encountered if the residual-quantity adjusting screw has been turned:

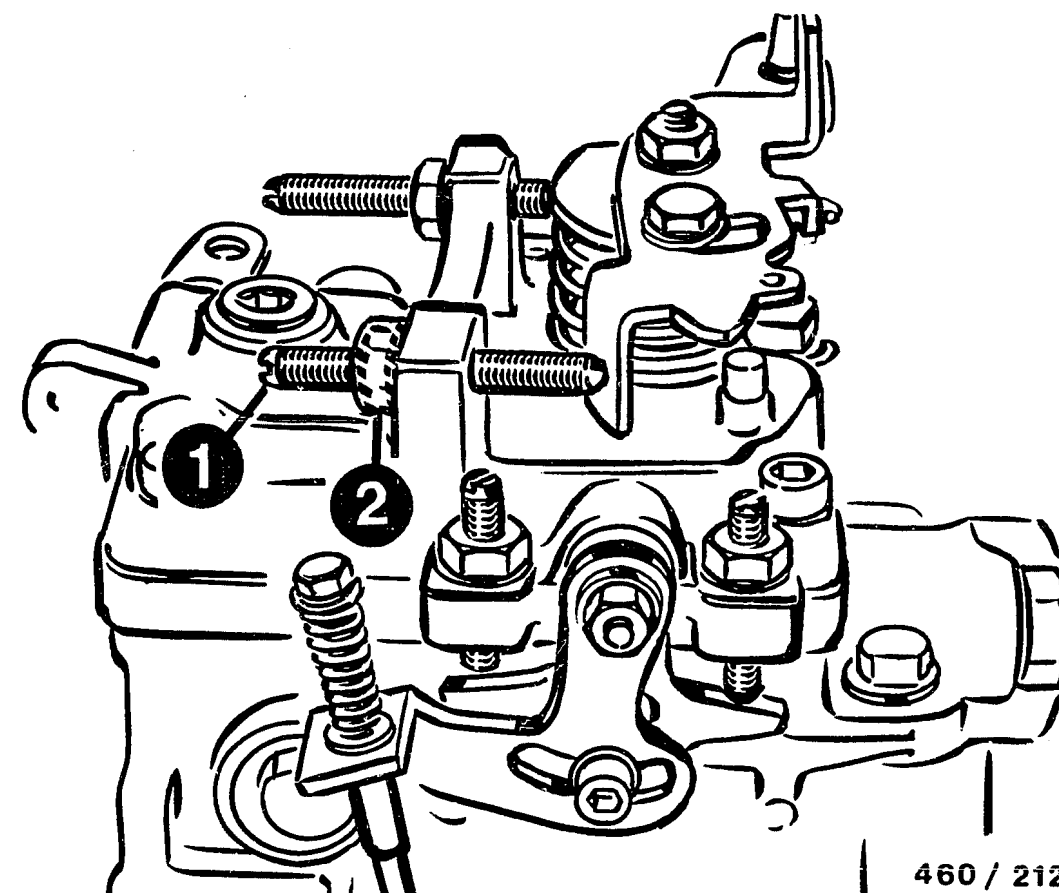
Residual-quantity adjusting screw screwed in:

- * Residual quantity too large - speed too high and idle setting not possible.

Residual-quantity adjusting screw screwed out:

- * Residual quantity too low - poor throttle take-up on starting off and acceleration from low speed or bucking in all gears.

460/2128



1 = Residual-quantity adjusting screw

2 = Securing cap

460/2129

Residual-quantity correction

Residual quantity too small:

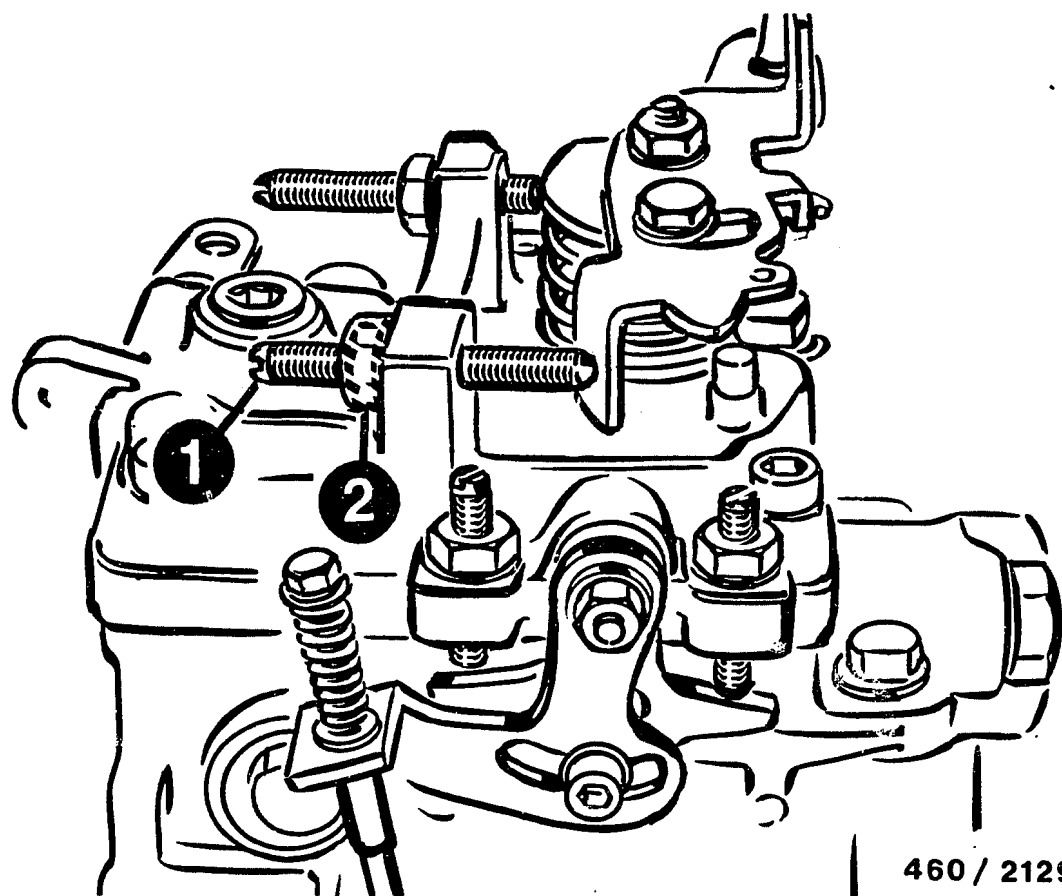
Remove securing cap.

Loosen lock nut on residual-quantity adjusting screw.

Screw in residual-quantity adjusting screw until there is a slight increase in idle speed.

Turn back residual-quantity adjusting screw by half a turn.

Lock adjusting screw and secure with new cap.



460 / 2129

- 1 = Residual-quantity adjusting screw
- 2 = Securing cap

Residual quantity too large:

* Idle speed too high

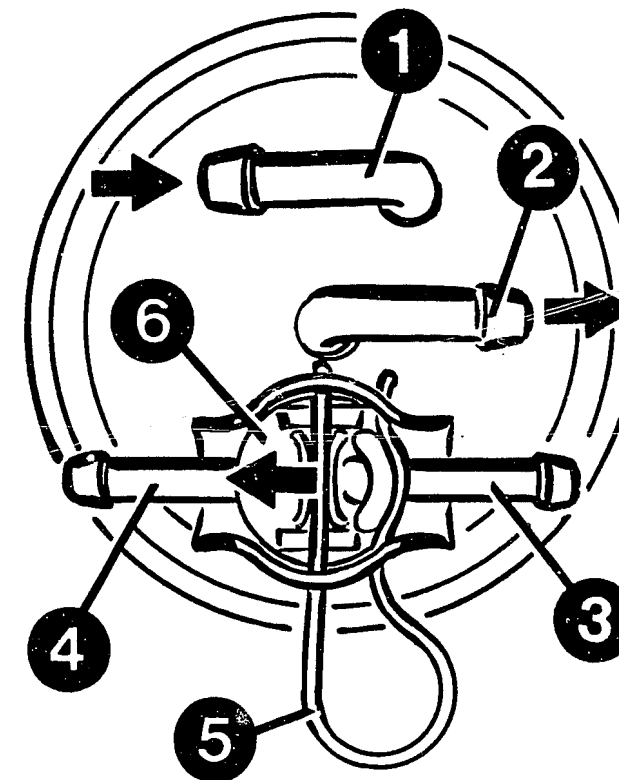
Remove securing cap.
Loosen lock nut of residual-quantity adjusting screw.

Screw out residual-quantity adjusting screw until there is no further change in idle speed.

Screw in adjusting screw again until there is a slight change in idle speed.

Turn back residual-quantity adjusting screw by half a turn.

Lock adjusting screw and secure with new cap.



460 / 2130

- 1 = Supply line from fuel tank
- 2 = Supply line to fuel-injection pump
- 3 = Return line from fuel-injection pump
- 4 = Return line to fuel tank (marked with arrow)
- 5 = Clip
- 6 = Control valve

DIESEL-FUEL-FILTER PREHEATING

* Installation instructions on changing filter

When changing filter, remove clip and detach control valve with connected fuel line.

Fit new O-ring and install control valve as shown.
Secure with clip.

If control valve is damaged on installation, the engine will start following installation, but no fuel will be drawn in.

Fit new control valve.

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Trouble-shooting instructions: FZG - 5000

BOSCH system : Vehicle electrics - General

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Test equipment and aids	10
Trouble-shooting program	11

General

When the electrical system of motor vehicles (e.g. ignition system, generator system) is operating, undesired, high-frequency, electromagnetic waves are generated, which may disrupt the reception of the receiving system installed in the vehicle, as well as the reception of receiving systems in other vehicles or of receivers located further away.

These high-frequency disturbances of reception are known as radio interference. The disruptions may be heard in the loudspeaker of the system in the form of buzzing, clicking, crackling, yawling or howling, and disrupt the useful received signal or render it under certain circumstances useless.

For this reason, suitable means must be sought by which these disturbances can be eliminated or reduced, i.e. the devices and systems (sources of interference) which cause this radio interference must be suppressed. This is achieved by connecting the sources of interference to suitable means of suppressing radio interference.

Classes of interference suppression

Long-range interference suppression

Long-range interference suppression is statutory for all motor vehicles and is provided by the vehicle manufact. The aim of long-range interference suppression is to avoid transmission of the interference signals generated in the vehicle to transmitting stations and receiving systems.

Short-range interference suppression

Short-range interference suppression is necessary if transmitting stations or receiving systems are to be operated in the vehicle. The demands made on the suppression equipment, and the engineering effort are greater in the case of short-range interference suppression than with long-range interference suppression.

Means of interference suppression

Resistors

Spark-plug connectors, ignition-distributor caps and distributor caps with integrated interference suppression resistors, suppressed spark plugs.

Capacitors and chokes

Shunt, feed-through and by-pass capacitors, chokes and interference-suppression filters.

Shielding

Shielded spark plugs, H.T. ignition cables, and distributor caps.

Ground

Ground straps of metal braiding.

Sources of interference

1. Ignition system: sparks at spark plug and distributor cap, contact-breaker sparks with breaker-triggered systems.
2. Generator system: howling noises caused by magnetic rotating field and generator regulator.
3. Electrical consuming devices: brush arcing of electric motors.
4. Switching contact: contact arcing on actuating relays and switches.
5. Lead connections: loose contacts in current-carrying conductors, poor ground of antenna, loose contact in H.T. ignition cables, charging lead of alternators.
6. Electrostatic charge of: generator V-belt or of transmission components, bowden cables, exhaust systems and tires.
7. Electronic systems: Interference may be caused by retrofitted systems or systems fitted ex-works such as a vehicle computer or digital displays.

In addition, interference may be caused by poor or alternating metallic contact between metallic components of the vehicle.

Detection of interference, notes on elimination of interference

Antenna installation

Despite optimum suppression, a residual noise level remains in the immediate vicinity of the source of interference. For this reason, the vehicle antenna must be mounted as far away from the source of interference as possible; the installation instructions for the antenna/of the vehicle manufacturer must be observed in every detail.

Telescopic rod antennas must be cleaned from time to time using for example an antenna cleaning cloth.

Detection of the source of interference

The source of interference may be detected on the basis of the interference noise audible in the loudspeaker.

Ignition interference

Buzzing and crackling dependent upon the engine speed. Run the engine at increased, constant engine speed, then switch off the ignition. Interference noise disappears on switching off the ignition.

Generator interference

Howling and yowling dependent upon the engine speed. Run the engine with increased engine speed, switch on consuming devices, intensity of interference noise increases, switch off ignition. Interference noise is no longer audible after switching off ignition.

Interference through auxiliary units

Interference in the form of howling and buzzing when an auxiliary unit is switched on (e.g. windshield wipers, fan). Interference disappears on switching off the unit.

Detection of the noise path

Interference via the antenna

For rapid diagnosis, turn volume control to left stop (quiet).

Interference noises which did reach the receiver via the antenna are now no longer audible.

Interference in leads

Interference which reaches the receiver via the positive or negative leads or the loudspeaker leads is in most cases low-frequency interference which makes its way from the source of interference to the input of the receiver via the vehicle electrical system.

To test for this, turn the volume control knob of the unit fully back to the "zero volume" position. (Engine must be running). The interference noise remains audible at the same volume.

Interference via the connection leads of radio components

The same as interference in leads. Interference irradiation e.g. in connection leads between car radio and booster/equalizer or cassette deck.

To test for this, turn the volume control knob of the unit fully back to the "zero volume" position (engine must be running).

The interference noise remains audible at the same volume.

USING THE TROUBLE-SHOOTING CHART AND
TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING chart starts on Coordinate 09 and contains customer complaint (fault symptom/characteristic) with several possible causes (component faults) in each case, as well as coordinate references for detailed trouble-shooting. If no coordinate reference is given, it is a matter of a cause which cannot be eliminated by means of interference suppression, such as shading of the received signal or multipath reception.

If the customer complaint has been clearly diagnosed, perform trouble-shooting in the given order of the possible causes, one after the other and step by step.

If the customer complaint has not been clearly diagnosed, check all the causes listed in the trouble-shooting chart. To prevent possible incorrect measurements, check all causes in the order given (because of the interlinking of test steps).

HOW TO USE TROUBLE-SHOOTING CHART AND
TROUBLE-SHOOTING PROGRAM (continued)

The TROUBLE-SHOOTING PROGRAM contains all system and component checks mentioned in the trouble-shooting chart. It is divided into three rows of boxes.

The left-hand column contains test instructions and set values.
The center column contains instructions on trouble-shooting and fault rectification.
The right-hand column contains the illustrations/terminal diagrams belonging to the text, with explanations.

If the questions in the left-hand column can be answered conclusively with "yes", continue trouble-shooting with the next box down.

If the answer to the question is "no", branch to the center column and carry out the tests in the order given there.
After rectifying a fault repeat the test as a check.

TROUBLE-SHOOTING CHART

Customer complaint (symptom of trouble)

- Buzzing and crackling (dependent upon engine speed)
- High-pitched howling and yowling (dependent upon engine speed)
- Interference from auxiliary units
- Buzzing and crackling caused by vibrations
- Crackling and clicking when ignition switched on
- Howling and yowling (dependent upon generator load)
- Heterodyne whistling
- Strengthening and weakening of volume
- Interference caused by obstructions

Cause (component fault)									
		*							Vehicle antenna
		*							Cable connections
*		*							Ignition system
*	*			*					Generator system
*	*			*					Electrical consuming devices
*	*								Secondary source of interference
			*						Electronic systems
*	*			*					Laying of lines
	*			*					Common grounding point
					*				Multipath recep. (in L, M and S bands)
					*				Fading (in all bands)
					*	*			Shading (in VHF band)
					*				Reflection (in VHF band)
					*				Lattice-fence effect (in VHF band)

NECESSARY TEST EQUIPMENT, AIDS

Motortester, e.g.	MOT 201	0 684 000 201
Multimeter		
e.g.	Fluke 23	comm. avail.
Universal grease	Ft 1 V 36	5 700 014 082
Ground-contact scraper		8 697 910 251
Contact protective grease and anti-corrosion grease		6 787 317 207

TROUBLE-SHOOTING PROGRAM (1)

V

Testing vehicle antenna

Note:

The following tests can only be performed with passive rod antennas. If the cause of trouble is thought to be an electronic antenna, the interference behavior is to be checked on a trial basis with a conventional rod antenna.

Disconnect antenna plug from radio receiver.

Attention! If length of antenna cable > 3.5 m, take shortening capacitor into consideration.

Connect ohmmeter in turn to:

1. Antenna plug term. 1 and term. 2 (insulation).

Set value: > 1 M Ω

2. Antenna plug term. 2 and antenna base (shielding).

Set value: approx. 0 Ω

3. Antenna base and engine block (ground of base).

Set value: approx. 0 Ω .

4. Antenna plug term. 1 and retractable-rod tip (continuity).

Set value: 0 up to max. 3.5 Ω .

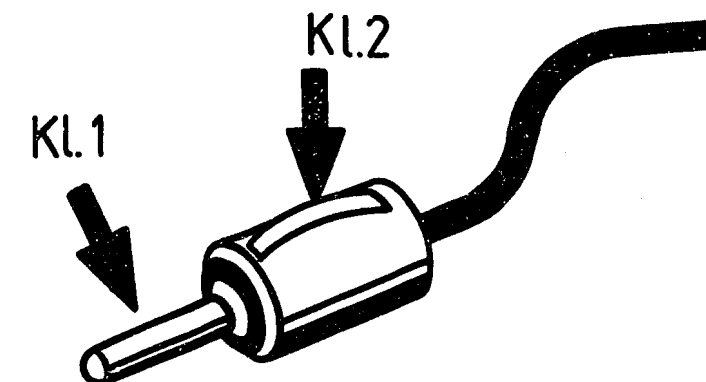
Are set values obtained in tests 1 to 4?

N>

Clean vehicle antenna, e.g. using Bosch antenna cleaning cloth. Disassemble antenna, scrape antenna hole blank using a ground-contact scraper from below and grease with Bosch universal grease.

Repeat measurements as per points 1 - 4.

If set values are not obtained, replace vehicle antenna.



290/2

Y

V

Return to trouble-shooting chart

H11

==>

H12

<==

TROUBLE-SHOOTING PROGRAM (2)

V

Testing cable connections

Test electrical connections and junctions of the radio components for good connection and contact.

Cable connections OK?

N>

Repair cable connections and/or wiring harness.

Y

Return to trouble-shooting chart

TROUBLE-SHOOTING PROGRAM (3)

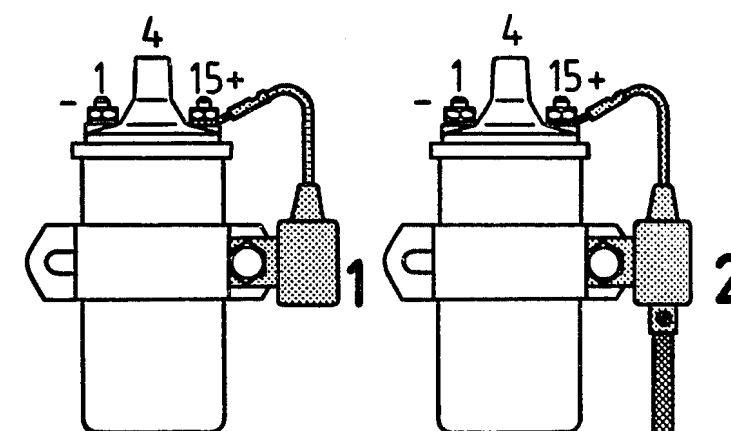
Testing interference field, ignition. (High-voltage side)

Test spark plugs, spark-plug connectors, interference-suppression resistors, ignition cables, distributor cap, distributor rotor etc. for correct functioning (e.g. open circuit, shunt).

Assessment e.g. using ignition oscillogram, resistance measurement and visual check.

Note: electronic ignition systems must be interference-suppressed with at least 2 k Ω . The original distributor rotor with 1 k Ω must not be replaced by a 5 k Ω distributor.
High-voltage side
OK?

Repair high-voltage side.



290/4

Illus.: short-range interfer. suppr. of the ign. coil (example)

1 = Suppression capacitor (ign. coil connected to ground)

2 = Suppression capacitor and ground strap (ign. coil not connected to ground).

Testing interference field, ignition (continued)

Test ignition-coil connections for firm seating and oxidation. Visual examination OK?

Tighten ignition-coil connections, eliminate oxidation.

Testing interference field, ignition (continued)

Is ignition coil term. 15 connected to suppression capacit.?

Apply suitable suppression capacitor to ign. coil term. 15.

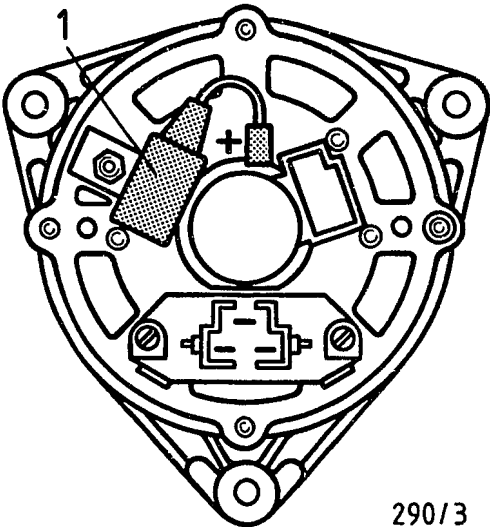
Return to trouble-shooting chart

TROUBLE-SHOOTING PROGRAM (4)

Testing the generator system
Is generator term. B+ connect-
ed to suppression capacitor?

N>

Connect generator to suitable
suppression capacitor.



290/3

1 = Suppression capacitor

Return to trouble-shooting chart

TROUBLE-SHOOTING PROGRAM (5)

V

Electrical consuming devices

Start engine and run at
idle.

Switch on radio unit.

Detect source of interference
by connecting electrical consum-
ing devices into the circuit.

Repeat test at higher engine
speed.

Interference noise must not
be heard from the loudspeaker.

Test OK?

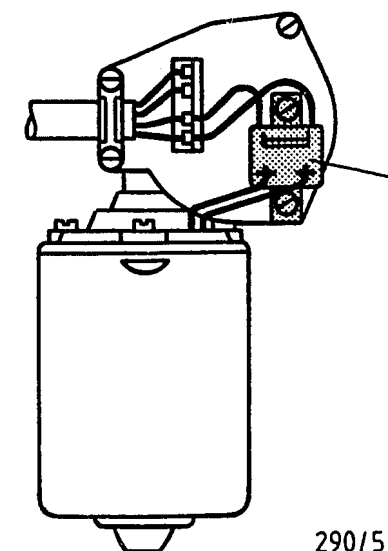
N>

Connect suitable interference-
suppression filters such as
0 290 003.., 0 290 002.. to
interfering component, or connect
component housing to bodywork with
ground strap.

Renew defective components.

Y

Return to trouble-shooting chart



290/5

Illus: short-range interference
suppr. of a wiper motor (example).

1 = Interference-suppr. filter

TRUBLE-SHOOTING PROGRAM (6)

V

Secondary source of interference

Lay voltage-supply leads of
radio components, antenna leads
and loudspeaker leads separately
from bowden cables (e.g. of
heater control mechanism and
engine hood lock).

Laying of leads OK?

N>

Check new laying of leads
for sources of interference.

Y

Return to trouble-shooting chart

H21

<==>

H22

<==>

TROUBLE-SHOOTING PROGRAM (7)

V

Electronic systems

Lay voltage-supply leads of radio receiver, antenna leads and loudspeaker leads separately from e.g. wiring harness of injection system. Lay antenna lead through the footwell, near to the firewall.

N>

Inspect new laying of lines for sources of interference.

Laying of lines OK?

Y

Return to trouble-shooting chart

TROUBLE-SHOOTING PROGRAM (8)

V

Testing laying of lines

Voltage-supply leads for radio components, antenna lead and loudspeaker leads must be laid separately from the vehicle wiring harness.

Twist loudspeaker leads or provide with braiding if necessary.

Installation and laying of leads OK?

N>

Inspect new laying of lines for sources of interference.

Y

Return to trouble-shooting chart

TROUBLE-SHOOTING PROGRAM (9)

Testing common grounding point

For multi-component systems, all the components must have been fitted and electrically connected up as indicated by the manufacturer. All components must have a common grounding point.

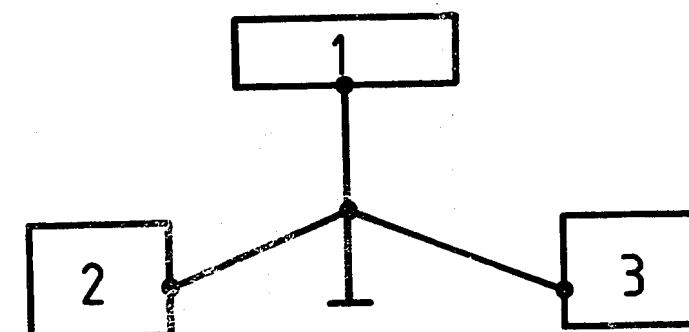
Have all components been properly installed?

N>

Rectify installation

By trying out, determine a new, more favorable common grounding point.

In the case of particularly stubborn interference, it may be necessary to provide the components with insulation with a point-to-point ground lead from the operating element (see picture).



290/1

1 = Car radio

2 = Booster/amplifier

3 = Equalizer

Return to trouble-shooting chart

Trouble-shooting instructions : ALF-5015
BOSCH system : LE2-Jetronic
Make of vehicle : ALFA ROMEO
Basic microcard : KFZ-00..

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SPECIAL FEATURES

These brief instructions, valid at the time of publication, apply to the following vehicle model with 1.995 l / 4-cyl. engine 064.76:

ALFA-ROMEO 164 2.0 Turbo i.e.
EU version 1.88->

- * LE2-Jetronic with 25-pole control unit:
0 280 000 372.
- * Engine-speed tripping at term. 15 of control unit by means of TD rectangular signals of Microplex ignition control unit term. 21.
- * In-tank electric fuel pump, accessible by way of closure ring at fuel tank.
- * Solenoid-operated injection valves with brass wire-wound coil.
- * 3-stage full-load relay (non-Bosch product).
Activated by way of full-load signal of control unit term. 6 and by way of engine-speed pulses from term. 1 of ignition coil.
- * Charge cooler and boost-pressure switch.
Maximum charge-air pressure 0.84 bar,
in "over boost" 1.08 bar.
- * Exhaust turbo-supercharger
- * For testing fuel pressure, make use of pressure measuring device with connection part KDJE-P 100/.. at fuel distributor inlet.

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.
For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!
High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

* Prevent fuel from being injected during the compression test.
For this reason, disconnect control relay.

For further precautionary measures, see basic instructions.

TROUBLE-SHOOTING CHART

Customer complaint (symptom of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Rough idling (engine speed, exhaust gas).
4. Poor throttle response, flat spot during acceleration.
5. Engine misfiring (ignition, fuel injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

Cause (component fault)										
*	*	*	*	*	*	*	*	*	*	Universal test adapter
*										Electric fuel pump
*	*	*	*							Auxiliary-air device/idle actuator
*	*	*	*	*	*	*	*			Air-flow sensor/air-mass sensor
*	*	*	*		*					Intake system
		*	*	*		*	*			Solenoid-operated injection valves
*	*	*			*	*				Fuel pressure
				*	*					Fuel quantity
		*	*	*	*	*				Throttle valve
				*						Overrun cut-off
*		*								Start control
				*						Ground
*	*	*	*	*	*					Alternator, interference suppress.
		*	*	*		*				CO exhaust-gas adjustment
				*						Control unit

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01

Adapter lead: 1 684 463 123

Test step	Switch		Termi- nals	Checking of component/function	Test instructions/ test conditions	Set values
	V	Ω				
1	5	—	1 — 5	TD pulses from ignition control unit	Testing not applicable since tripping takes place at term. 15 of control unit. See below under "Note".	— —
2	6	—	9 — 5 (+) (—)	Voltage from control relay term. 87	Put into neutral and start	8...15 V
3	7	—	4 — 5 (+) (—)	Voltage from ignition/starting switch term. 50	Put into neutral and start	8...15 V
4	 V	11	8 — 5	Resistor combination in air-flow sensor		100...200 Ω
5	 V	12	7 — 5	Resistance of potentiometer in air-flow sensor	Deflect sensor flap as far as it will go	60...1000 Ω
6	 V	13	10 — 5	Temperature-sensor resistance (engine)	+15...+30°C: approx. +80°C:	1,45...3,3k Ω 280...360 Ω
7	 V	14	13 — 5	Ground connection of output stage		0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (continued)
Adapter lead: 1 684 463 123

Test step	Switch	Ω	Termin-als	Testing of component/function	Test instructions/ test conditions	Set values
8	 V	16	2 - 9	Resistance of idle contact	Accelerator at rest : Accelerator depressed somewhat:	0...10 Ω Infinity Ω
9	 V	17	3 - 9	Resistance of full-load contact in throttle-valve switch, term. 3 with resistance of 3-stage full-load relay	Accelerator at rest : Accelerator completely depressed:	Infinity Ω 10...15k Ω
10	 V	18	12 - 9	Resistance of solenoid-operated injection valves connected in parallel	+15...+30°C : approx. +80°C :	6,8... 9,5 Ω 7,0...10,0 Ω

NOTE: The following components and corresponding leads are not covered by the universal test adapter during testing:

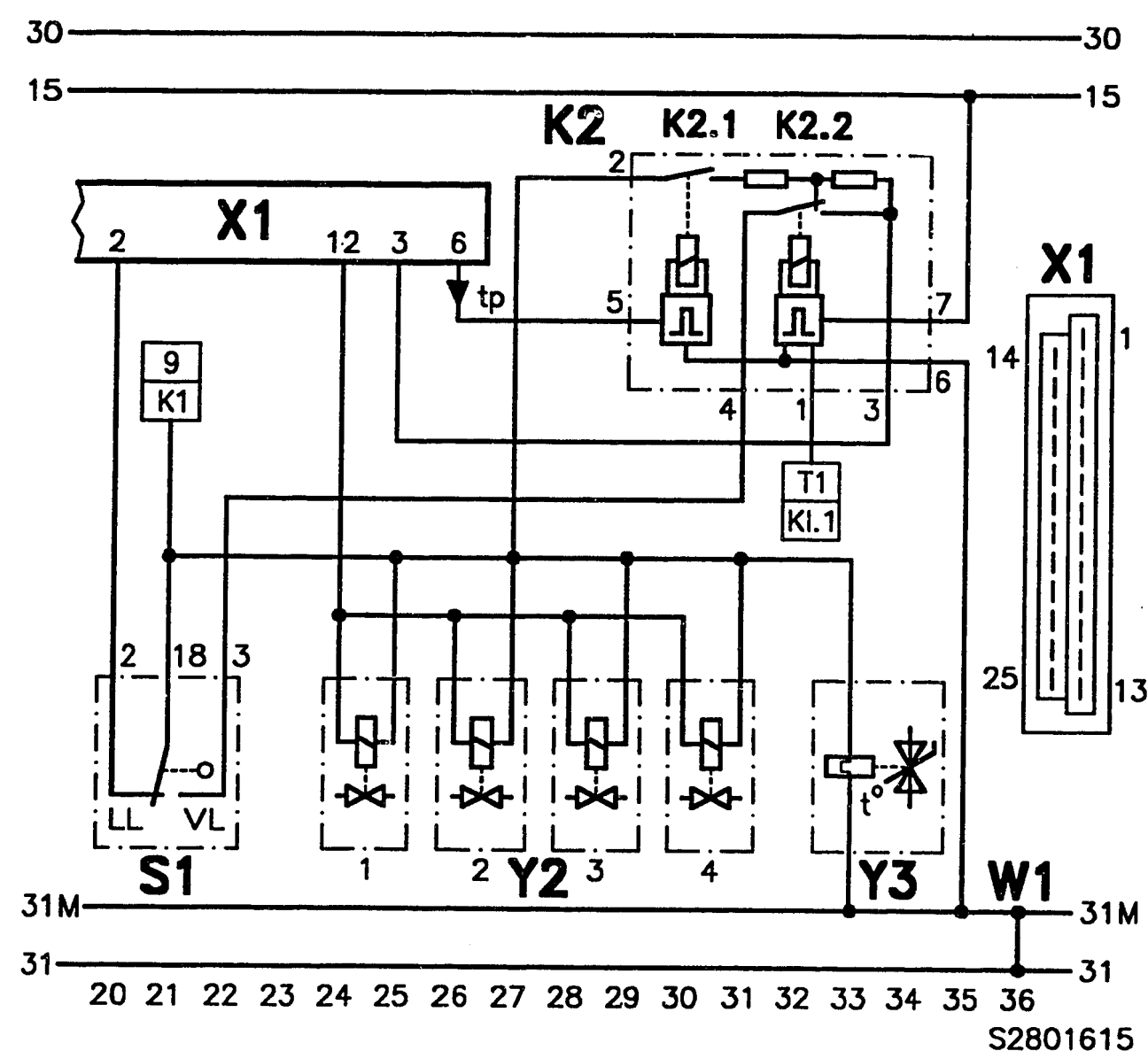
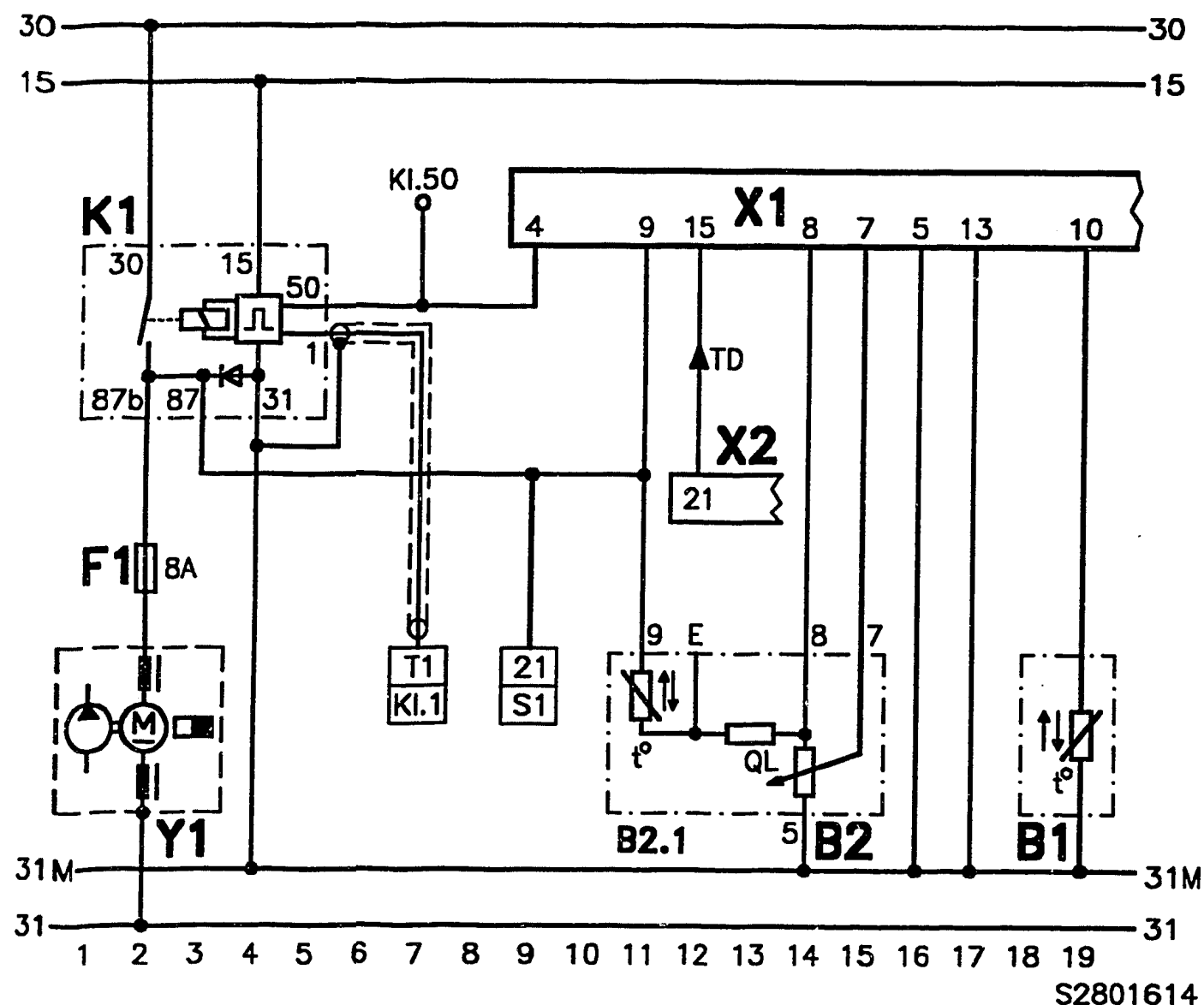
1. TD rectangular signal from Microplex ignition control unit term. 21. Oscilloscope to term. 15 and term. 5. Voltage excursion min. 80% U-battery.
2. Auxiliary-air device: Pos. lead from t. 87 of control relay, neg. lead to eng. ground.
3. Electric fuel pump: Pos. lead from t. 87b of control relay (via pump fuse), neg. lead to vehicle ground.
4. 3-stage full-load relay: Pos. lead from t. 15 of ignition/starting switch to t. 7, neg. lead from t. 6 to eng. ground.
Pos. lead from t. 87 of control relay to t. 2, Term. 1-signal from ign. coil to t. 1
Load signal from t. 6 of control unit to t. 5.

TEST SPECIFICATIONS

Component/function	Set values
Electric fuel pump	
* Fuel delivery at return:	At least 850 cm ³ /30 s
* Supply voltage under load:	At least 12 V
Pressure regulator	
* Fuel pressure with engine at standstill:	2,8...3,2 bar
at idle:	Approx. 0.5 bar lower
Fuel system, leakages	
* Fuel pressure after 20 mins. with engine at standstill:	At least 1.0 bar
Auxiliary-air device	
* Resistance value	35...70 Ω
Air-flow sensor	
* Resistance value between	
Term. 8 and term. 5:	340 ... 450 Ω
Term. 7 and term. 5:	60 ...1000 Ω 1)
Term. 9 and term. 5:	500 ... 760 Ω
Term. 8 and term. 9:	160 ... 300 Ω
1) (Fully deflect air-flow sensor flap)	
Temperature sensor (engine)	
* Internal electrical resistance at ambient temperature +15...+30°C:	1,45...3,3 k Ω
With engine at normal operating temperature approx. +80°C :	280...360 Ω

TEST SPECIFICATIONS (continued)

Component/function	Set values
Solenoid-operated injection valve	
* Internal resistance at ambient temperature +15...+30°C:	14.5...17.5 Ω
* Leakage after 60 s:	no droplet may drip off
Start control	
* Voltage at injection valve on start initiation:	greater than 1.5 V
after approx. 15s:	approx. 0.5 V
Exhaust turbo-supercharger	
* Maximum charge-air pressure:	0.84 bar
"over boost":	1.08 bar
Idle setting	
Engine at operating temperature, approx. +80°C	
* Idle speed:	700...800 min ⁻¹
* CO content:	1,0...2,0 vol. %
Refer to Equipment and Autodata microcard for settings as regards ignition, valve clearance and other engine-related data.	



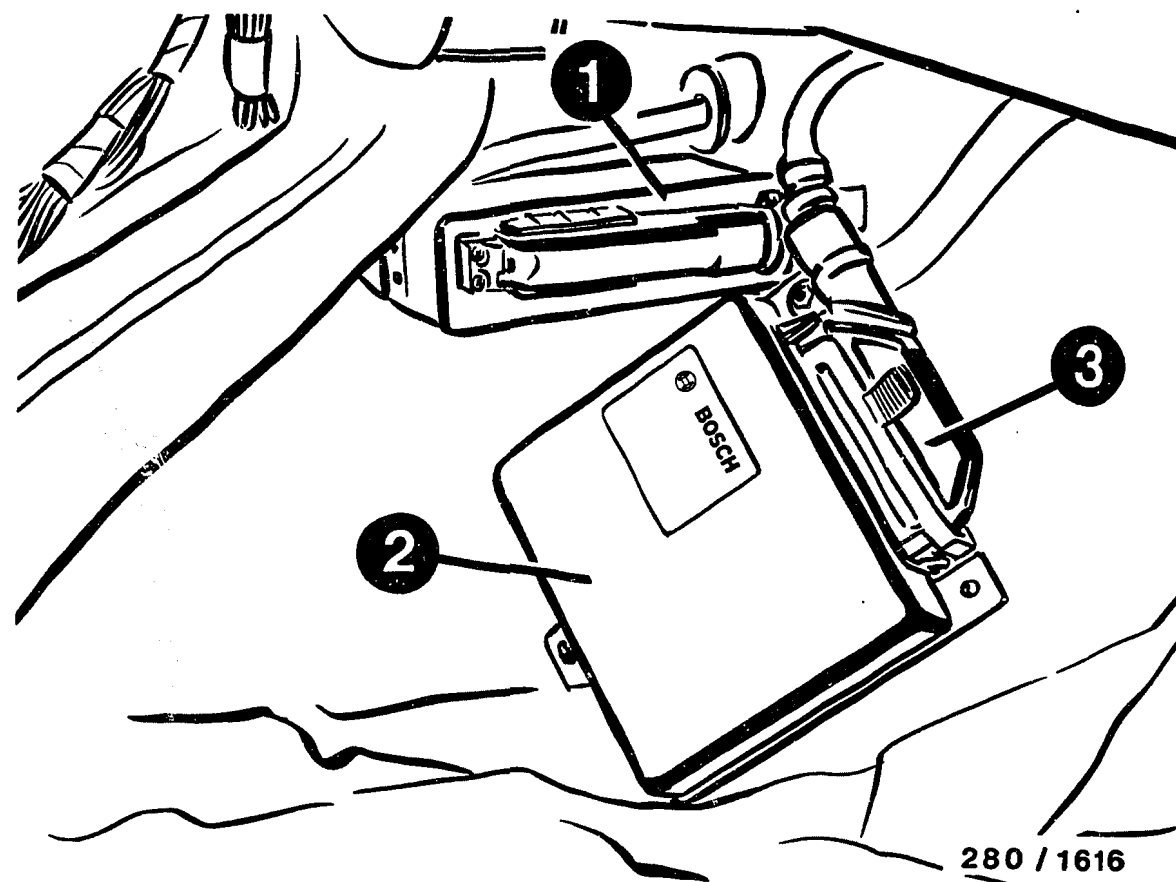
ELECTRICAL TERMINAL DIAGRAM

B1 = Temperature sensor (engine)
B2 = Air-flow sensor
B2.1 = Temperature sensor (intake air)
F1 = Fuse (fuel pump)
K1 = Control relay

K2 = 3-stage full-load relay
K2.1 = Load relay
K2.2 = Engine-speed relay
S1 = Throttle-valve switch
T1 = Ignition coil

W1 = Ground strap, engine
X1 = Control-unit plug
X2 = Microplex connector socket
Y1 = Electric fuel pump
Y2 = Solenoid-operated injection valves
Y3 = Auxiliary-air device

Re K2: 1st stage with t_p load signal from term. 6 (without throttle-switch signal).
2nd stage only throttle-valve switch closed.
3rd stage throttle-valve switch closed and engine-speed signal.



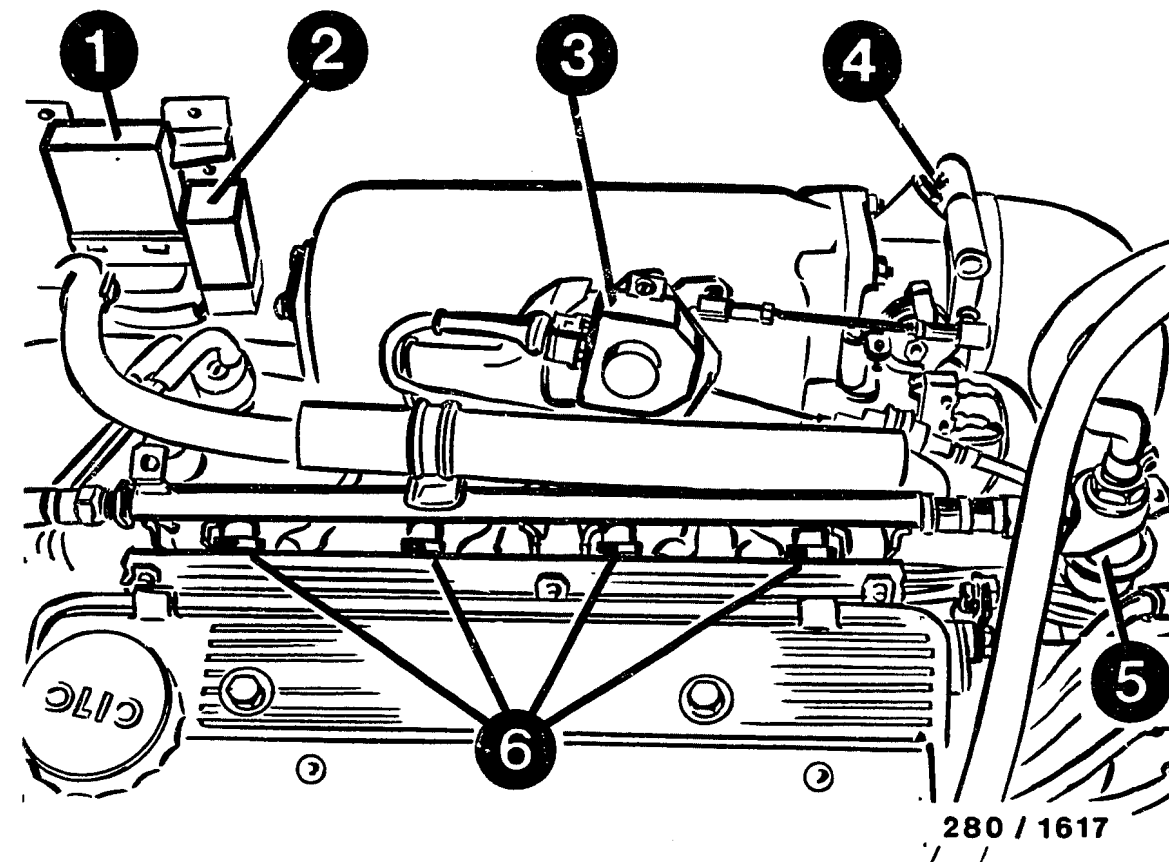
- 1 = ABS control unit
- 2 = LE2 control unit
- 3 = 25-pole control-unit plug

INSTALLATION POSITION OF COMPONENTS

The installation locations always refer to the direction of travel.

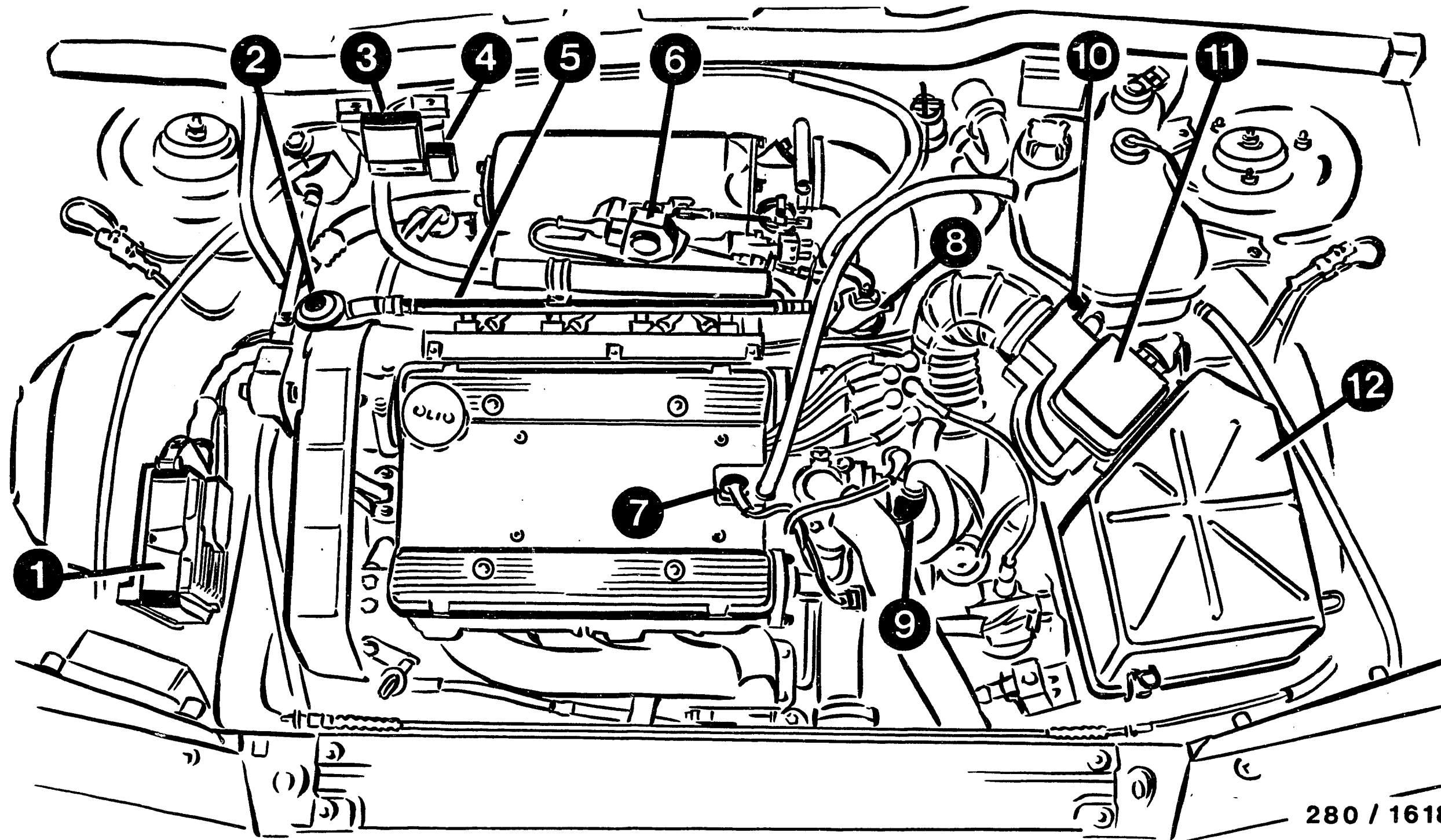
The LE2-Jetronic control unit is located behind the center console on the tunnel.

For electrical testing with universal test adapter, press up detent (catch) and pull off control-unit plug. Connect 25-pole adapter lead to detached control-unit plug (periphery testing only).



Arrangement of components on engine

- 1 = 3-stage full-load relay
- 2 = Control relay
- 3 = Throttle-valve switch
- 4 = Idle-speed bypass screw
- 5 = Pressure regulator
- 6 = Solenoid-operated injection valves



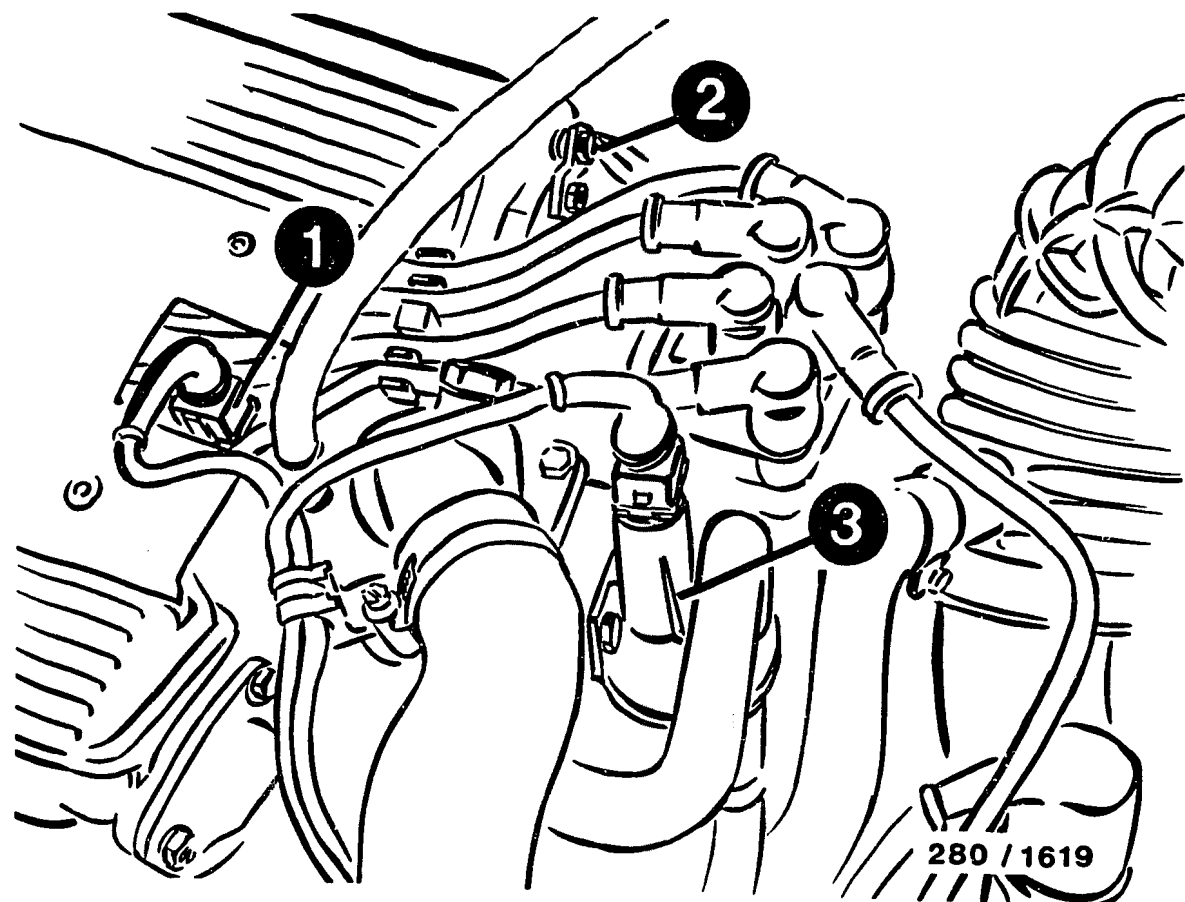
280 / 1618

1 = Microplex ignition control unit
 2 = Fuel pressure damper
 3 = 3-stage full-load relay
 (non-Bosch product)
 4 = Control relay

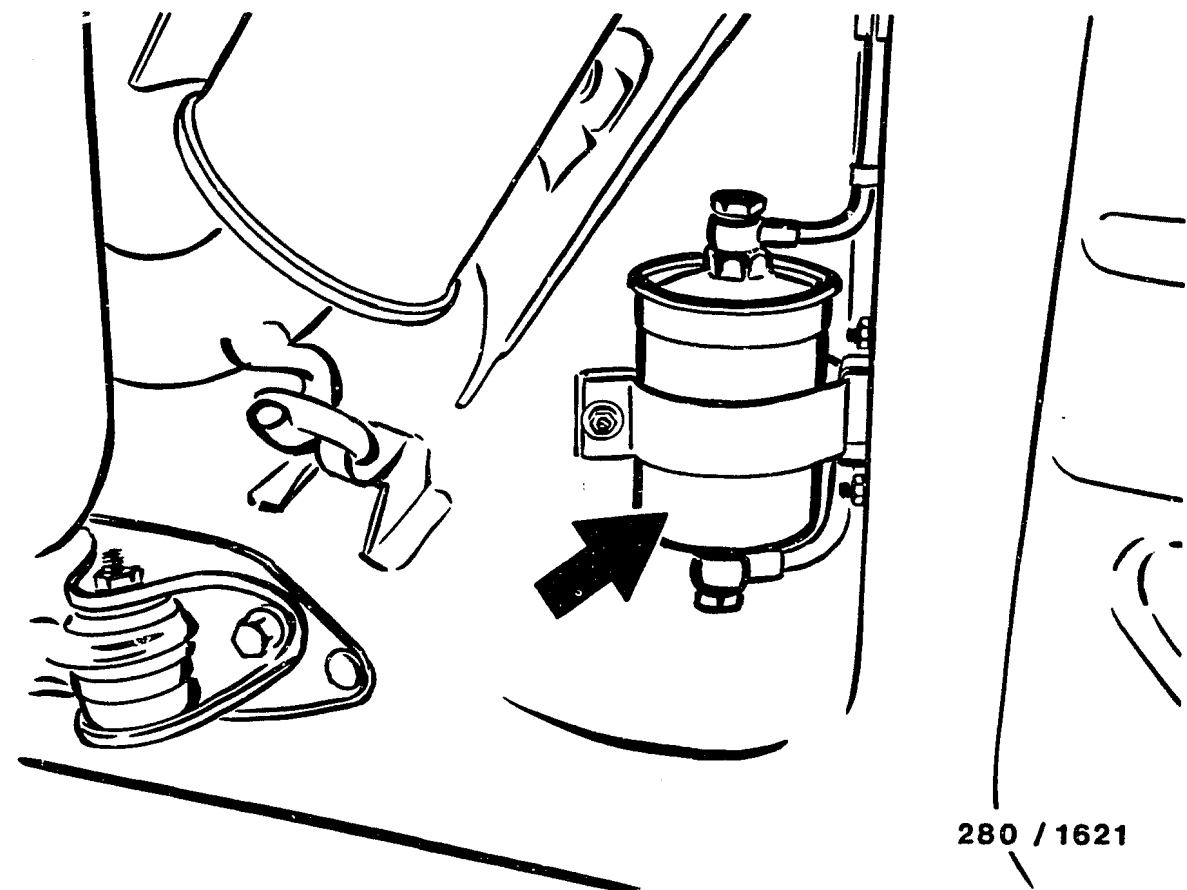
5 = Fuel-distribution pipe with
 solenoid-operated injection valves
 6 = Throttle-valve switch
 7 = Temperature sensor (engine)
 8 = Pressure regulator

9 = Auxiliary-air device
 10 = CO-bypass screw
 11 = Air-flow sensor
 12 = Air filter

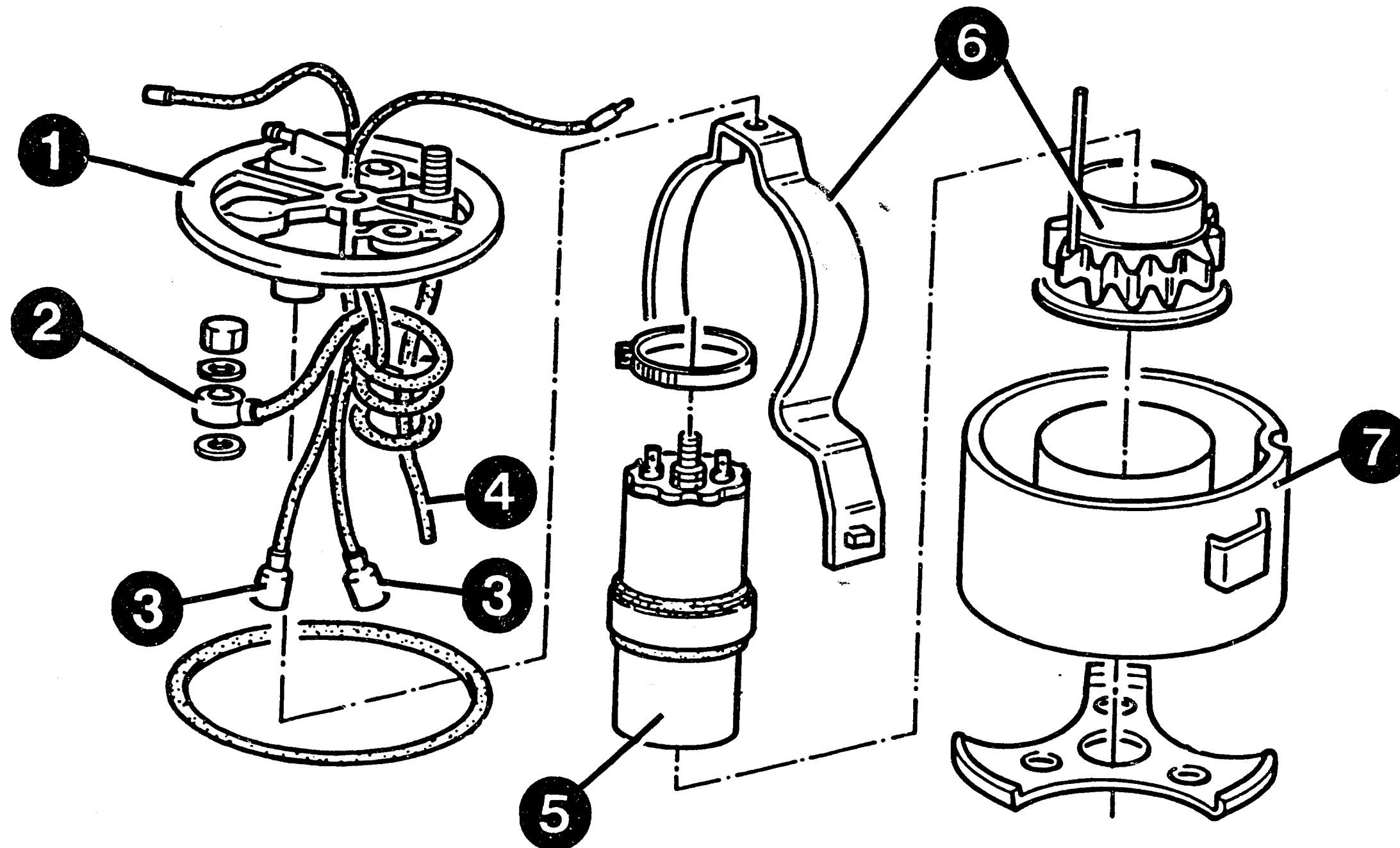
Installation position of components (continued)



- 1 = Temperature sensor (engine)
- 2 = Central ground
- 3 = Auxiliary-air device



Arrow = Fuel filter



280/1622

- 1 = Closing cover
- 2 = Fuel-injection tubing
- 3 = Connecting leads
- 4 = Fuel return line

- 5 = In-tank electric fuel pump
- 6 = Pump bracket
- 7 = Fuel prefilter

Configuration of in-tank electric fuel pump

Trouble-shooting instructions : SAA-5004
 BOSCH system : EI-K
 Make of vehicle : SAAB
 Basic microcard : KFZ-00..

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SPECIAL FEATURES

These brief instructions, valid at the time of publication, apply to the following Saab model:

Saab 900i 16, EU/US 08.87 ->
 Engine B 202i 2.0 l / 4 cyl.

- * Electronic ignition system with self-diagnosis (knock control only)
- * Self-diagnosis with single-digit flashing code.

Note :

The fault lamp may light up continuously in the case of vehicles with LH 2.2 Jetronic. This indicates emergency operation of the LH-Jetronic.
 In the case of vehicles with LH 2.4 Jetronic, the fault lamp gives an indication of ignition and Jetronic faults.

- * Activation of self-diagnosis and flashing-code evaluation by way of evaluation unit KDAW 9980.

Activation:

Start engine and run briefly at > 1000 min⁻¹ ; then allow to idle. The flashing code is output only when idling with idle contact closed and is repeated until the ignition is switched off.

- * Acceleration knock in low engine-speed range. (Vehicles up to mid '88)

Reason:

Short to ground in load-signal lead; as a result the ignition angle is already advanced in the low engine-speed range.

SPECIAL FEATURES (CONTINUED)

* EI-K control unit 0 227 400 127

Installed in vehicles with LH 2.4 Jetronic in conjunction with Hall pulse generator in ignition distributor.
(35-pole LH-control unit; therefore other pin assignment)

* EI-K control unit 0 227 400 129
0 227 400 130

With additional fault code 3 (knock detection).
Installed in vehicles with LH 2.2 Jetronic in conjunction with Hall pulse generator on crankshaft and H.T. distributor.
(25-pole LH-control unit)

* EI-K control unit 0 227 400 150

With additional fault code 3 (knock detection)
Installed in vehicles with LH 2.4 Jetronic in conjunction with Hall pulse generator on crankshaft and H.T. distributor.
(35-pole LH-control unit)

* Ignition-coil/trigger-box combination model year 89 only 0 221 600 055
(with current limitation).

SPECIAL FEATURES (CONTINUED)

* Divergent test step for EI-K control-unit function for vehicles with ignition-coil/trigger-box combination
0 221 600 055.
Perform trouble-shooting and fault correction as follows:

Set value (rectangular pulse at least 2.5 V) not attained?

Detach EI-K control-unit plug and trigger-box plug.
Check lead between EI-K control-unit plug term. 16 and trigger-box plug term. 4 for open circuit, short to positive and short to ground.
Eliminate fault.

No fault present?

1. Attach EI-K control-unit plug.
2. Connect resistance of 240...270 Ω (e.g. with commercially available resistance decade) to detached trigger-box plug term. 4 and term. 2.
3. Connect oscilloscope "special" with red clip to trigger-box plug term. 4 (+) and black clip to vehicle ground.
4. Start engine.
Oscilloscope must show a rectangular pulse of at least 2.5 V.

Renew trigger box if set value attained.

Renew EI-K control unit if set value not attained.

SPECIAL FEATURES (CONTINUED)

- * Ignition coil with the exception of model year 89
0 221 122 327
- * Trigger box with the exception of model year 89
0 227 100 124
(with current limitation).
- * Ignition distributor up to model year 88
0 237 506 ...
- * H.T. distributor as of model year 89
(Magnetic pulse generator on crankshaft)
0 237 501 ...
- * Knock sensor 0 261 231 006
- * Without ignition pulse amplifier

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.
For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!
High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on.
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

Cause (component fault)										
*	*	*	*	*	*	*	*	*	*	Self-diagnosis
*		*	*	*	*	*				H.T. end
*		*	*	*	*					Ignition coil
*		*								Firing sequence
*										Ignition-distributor and H.T. distributor as-installed setting
*										Voltage, EI-K control unit
*										Voltage, trigger box
*										Voltage, primary circuit
*										Magnetic-pulse-generator plug connection
*										Magnetic-pulse-generator voltage supply
*										Magnetic-pulse-generator function
*										EI-K control-unit function
*										Engine-speed signal, LH-Jetronic

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on (dieseling).
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

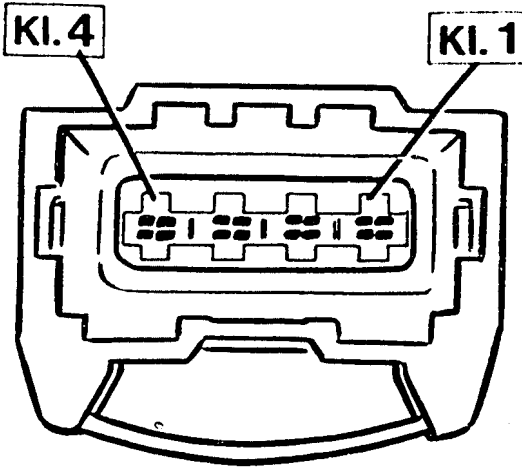
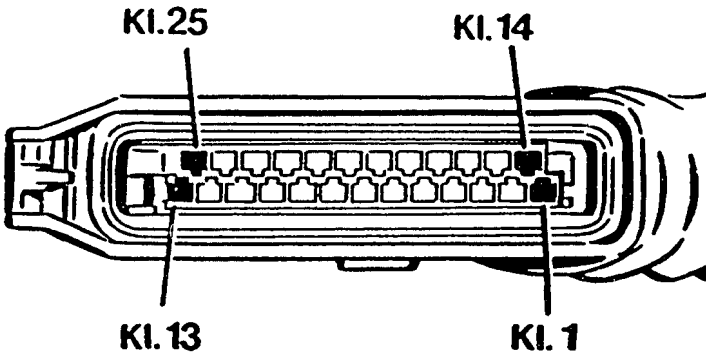
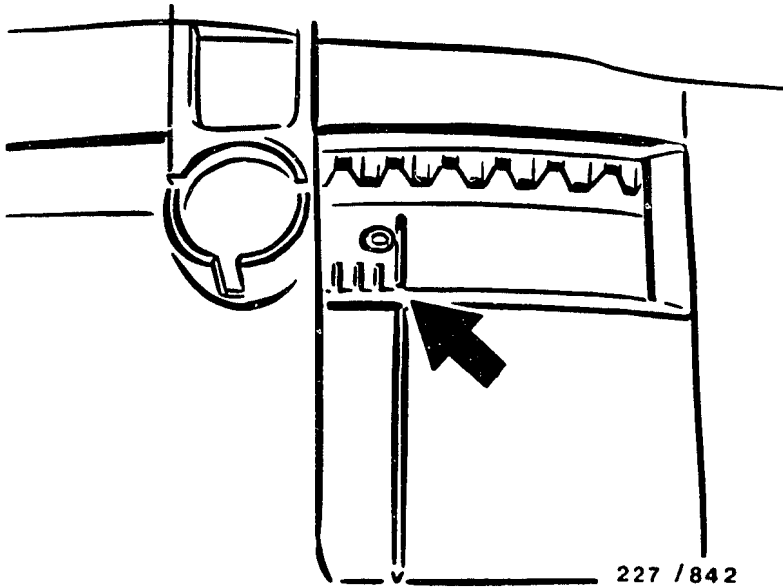
Cause (component fault)										
*										Contact resistances
*										Primary signal
									*	Fault lamp
							*			Throttle-valve-switch idle contact
		*	*		*	*	*	*		Ignition basic setting
				*						Peak-coil-current cutoff
				*						Voltage, trigger box (engine idling)
				*						Voltage, ignition coil (Engine idling)

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Cause of fault	Test instructions	Terminals	Set values
3	Knock detection	EI-K control unit defective.	—	—
4	Knock sensor	Visual inspection: Leads and knock-sensor plug (oxidation) Tightening torque 0 261 231 006 Internal resistance 0 261 231 006 (If no fault is established, cause may be to be found in EI-K control unit).	12 13	15...25 Nm infinity Ω
5	LH-Jetronic load signal	Voltage, EI-K control-unit plug with handle cover removed. Engine idling. Briefly accelerate to full throttle.	8 20 (+) (-)	Voltage > 0.1 V Voltage increase

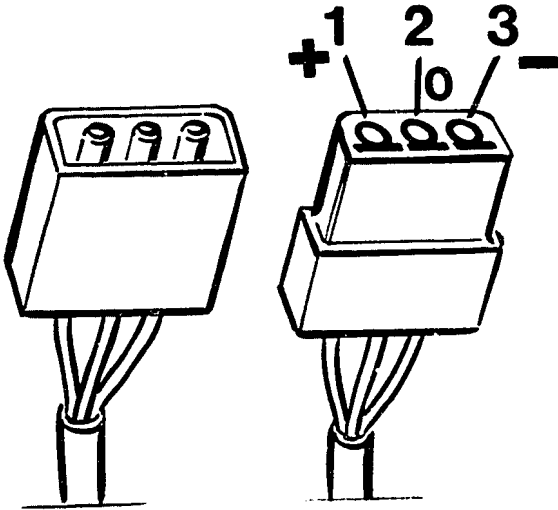
RAPID DIAGNOSIS CHART

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
1	H.T. END Check function (e.g. open circuit, shunt) of for example spark plugs, ignition harness and distributor cap. Assess for example by way of ignition oscillogram, resistance measurement, visual inspection.	—	—
2	IGNITION COIL Visual inspection: plug present, sealing compound oozed out? Resistance, primary. Resistance, secondary.	1 15 1 4	0,6... 1,0 Ω 6,4...11,1 k Ω
3	IGNITION-DISTRIBUTOR AND H.T. DISTRIBUTOR AS-INSTALLED SETTING Engine cyl. 1 at TDC in compression stroke. See top picture. (Arrow = TDC mark) Distributor rotor points towards mark on housing.	—	—
4	VOLTAGE, EI-K CONTROL-UNIT PLUG Detach EI-K control-unit plug. Voltage, EI-K control-unit plug. See center picture. Ignition ON.	6 20 (+) (-)	Battery voltage
5	VOLTAGE, TRIGGER BOX Detach trigger-box plug. Voltage, trigger-box plug. (Combination 0 221 600 055) see bottom picture. Or Voltage, trigger-box plug. (Trigger box 0 227 100 124) Ignition ON.	3 2 (+) (-) 4 2 (+) (-)	Battery voltage

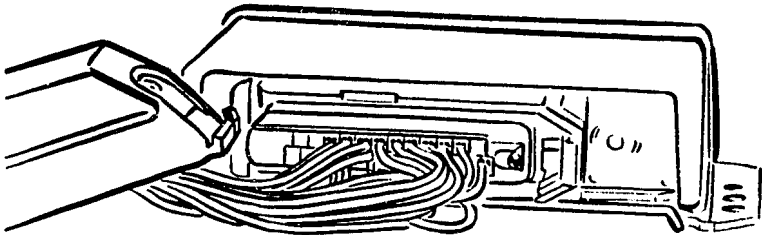


RAPID DIAGNOSIS CHART (CONTINUED)

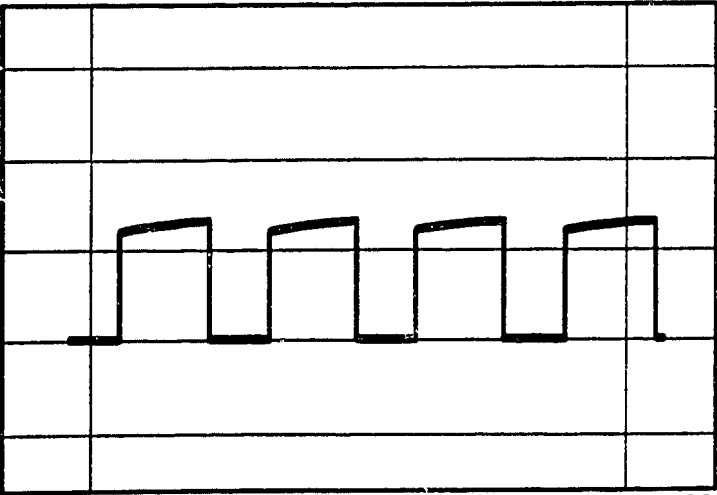
Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
6	VOLTAGE, PRIMARY CIRCUIT Detach cable of ignition coil term. 1. Attach trigger-box plug. Voltage, ignition coil and battery. Ignition ON.	15 B- (+) (-)	Battery voltage
7	MAGNETIC-PULSE-GENERATOR PLUG CONNECTION Visual inspection, magnetic-pulse-generator plug connection. "Oxidation" Plug connection for pulse generator, crankshaft beneath throttle-valve section. See top picture.	—	—
8	MAGNETIC-PULSE-GENERATOR VOLTAGE SUPPLY EI-K control-unit plug and magnetic-pulse-generator plug connected. Handle cover of control-unit plug removed. See center picture. Voltmeter connected to control-unit plug. Ignition ON. In the case of pulse generator in ignition distributor, measurement is performed on attached ignition-distributor plug.	4 10 (+) (-)	Equal to/greater than 10 V
9	MAGNETIC-PULSE-GENERATOR FUNCTION Handle cover, EI-K control-unit plug removed. Oscilloscope "special" to EI-K control-unit plug and vehicle ground. See center picture. Actuate starting motor. In the case of pulse generator in ignition distributor, measurement is performed on attached ignition-distributor plug.	24 20 (+) (-)	Rectangular pulse (Bottom picture)



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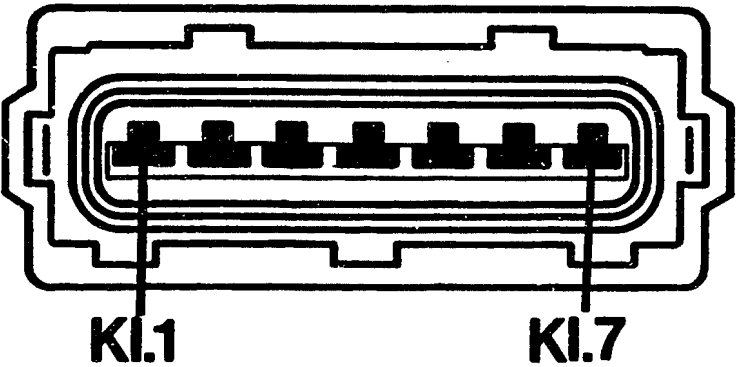
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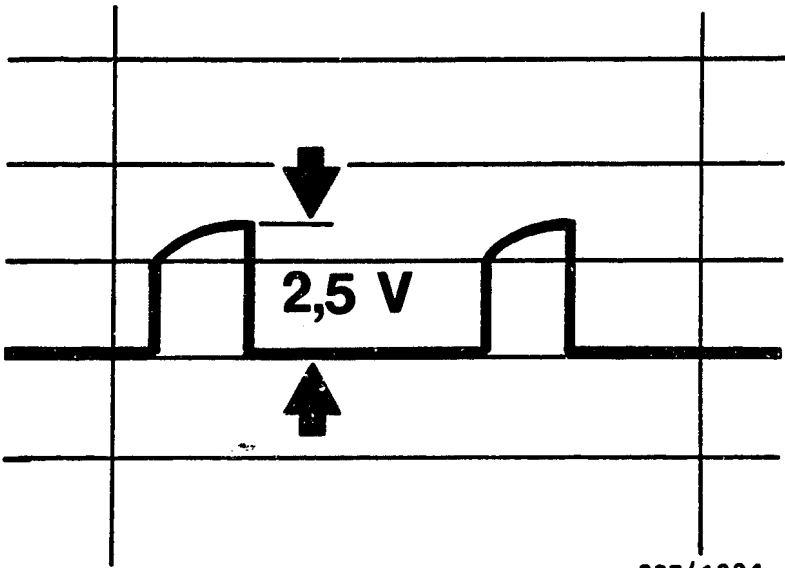
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RAPID DIAGNOSIS CHART (CONTINUED)

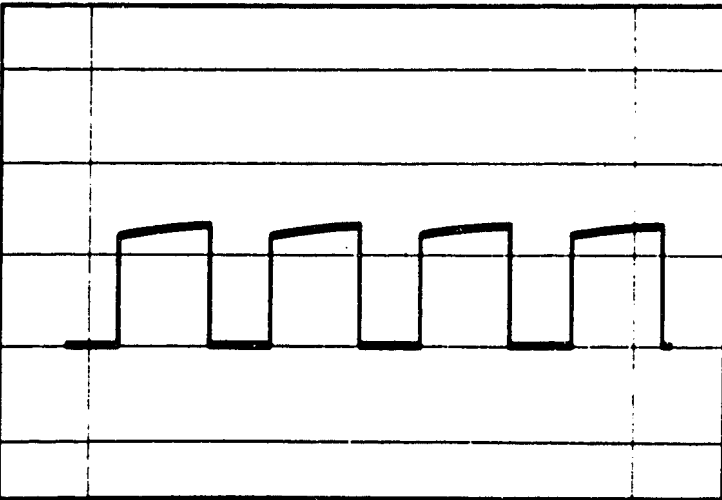
Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
10	<p>EI-K CONTROL-UNIT FUNCTION</p> <p>Trigger-box plug attached. Oscilloscope "special" to trigger-box plug. (Ignition-coil/trigger-box combination ... 055) Actuate starting motor. * Note: The minimum voltage is important and not the profile (edges may be smooth). If voltage is < 2.5 V, perform test as described under special features.</p> <p>In the case of trigger box ... 124 (plug detached) Oscilloscope "special" to trigger-box plug See top picture. Actuate starting motor.</p>	<p>4 2</p> <p>5 2 6 2 (+) (-)</p>	<p>* Rectangular pulse Equal to/greater than 2.5 V (Center picture)</p> <p>Rectangular pulse (Bottom picture)</p>
11	<p>ENGINE-SPEED SIGNAL (LH-Jetronic)</p> <p>Ignition OFF. Detach LH-Jetronic control-unit plug. Oscilloscope "special" to LH-Jetronic control-unit plug. Actuate starting motor.</p>	<p>1 B- (+) (-)</p>	<p>Rectangular pulse (Bottom picture)</p>
12	<p>CONTACT RESISTANCES (primary side)</p> <p>Detach negative and positive lead from battery. Switch on ignition. Resistance between battery terminal and trigger-box plug. (Combination ... 055) (Trigger box ... 124) Resistance between battery terminal and ignition coil. Resistance between trigger-box plug and ignition coil. (Only with trigger box ... 124)</p>	<p>B- 2 B+ 3 B+ 4 B+ 15</p> <p>1 1</p>	<p>max. 0.3 Ω</p> <p>max. 0.3 Ω</p>



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RAPID DIAGNOSIS CHART

Test step	Checking of component/function	Test instructions/ test conditions	Terminals	Set values
13	Primary signal	Oscilloscope/engine-speed tester to ignition coil. Actuate starting motor.	15 1 (+) (-)	Primary volt./eng.- speed indication (Magnitude irrel.)
14	Throttle-valve switch idle contact	Resistance, EI-K control-unit plug. Throttle-valve idle setting. Open throttle valve approx. 2°.	20 7	0 Ω Infinity Ω
15	Ignition basic setting	Only vehicle with ignition distributor 0 237 501 ... Run warm engine at idle. Idle contact closed. Determine ignition angle.		14 \pm 1° Before IDC 800...900 min ⁻¹
16	Peak-coil-current cutoff	Voltage, ignition coil. Ignition ON.	15 1 (+) (-)	0 V, or after approx. 1 s 0 V.
17	Voltage, trigger box	Push back rubber sleeve at trigger-box plug. Voltage at trigger-box plug. In the case of ignition-coil/trigger-box combination ... 055. In the case of trigger box ... 124. Engine idling.	3 2 4 2 (+) (-)	12...14 V, max. 1 V below U _B
18	Voltage, ignition coil	Voltage, ignition coil and battery. Engine idling.	15 B- (+) (-)	Equal to/greater than 10 V

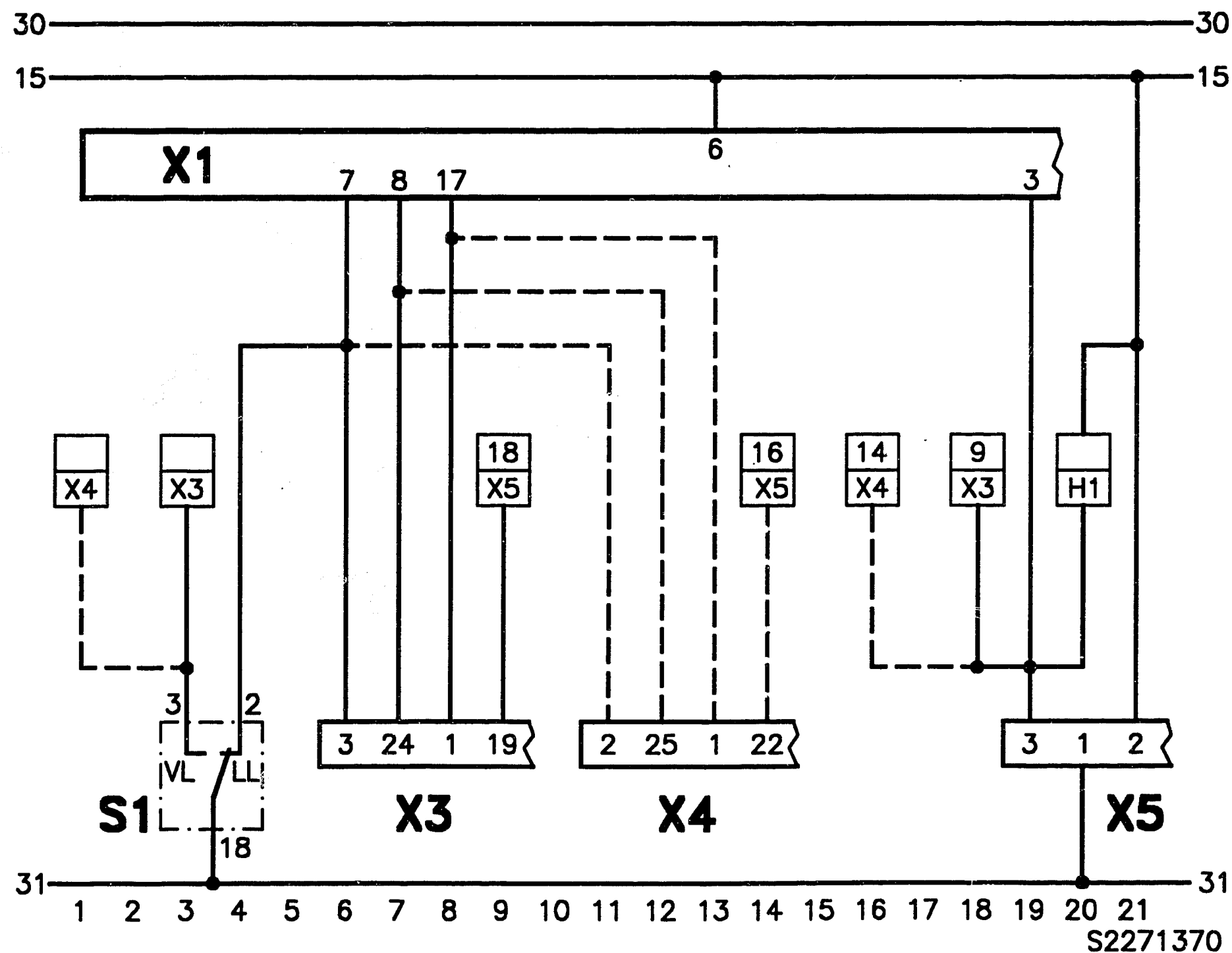
TEST SPECIFICATIONS

Ignition coil, primary	0,6... 1,0 Ω
secondary	6,4...11,1 k Ω
Voltage, EI-K control unit with ignition ON	Battery voltage
Voltage, trigger box with ignition ON	Battery voltage
Voltage, primary circuit with ignition ON	Battery voltage
Voltage supply, magnetic pulse generator with ignition on	Equal to/greater than 10 V
Magnetic-pulse-generator function at cranking speed	Rectangular pulse
EI-K control-unit function at cranking speed	Rectangular pulse
Engine-speed signal, LH-Jetronic at cranking speed	Rectangular pulse
Primary signal at cranking speed	Primary voltage/ engine-speed indication
Throttle-valve-switch idle contact	
Throttle valve closed	0 Ω
Throttle valve open approx. 2°	Infinity Ω
Peak-coil-current cutoff with ignition ON	0 V, or after approx. 1 s 0 V.

TEST SPECIFICATIONS (CONTINUED)

Tightening torque, knock sensor 0 261 231 006	12...25 Nm
Internal resistance, knock sensor 0 261 231 006	Infinity Ω
Ignition basic setting at	14 \pm 1° BTDC 800...900 min ⁻¹
(Only vehicle with ignition distributor 0 237 506 ...)	
Voltage supply, EI-K control unit with engine idling	12...14 V max. 1 V below U _B
Voltage, trigger box with engine idling	12...14 V max. 1 V below U _B
Voltage, ignition coil with engine idling	Equal to/greater than 10 V

Refer to Autodata test specifications for
settings as regards ignition, idle speed,
emissions and valve clearance etc.



H1 = Fault lamp, self-diagnosis
 S1 = Throttle-valve switch
 X1 = EI-K control-unit plug

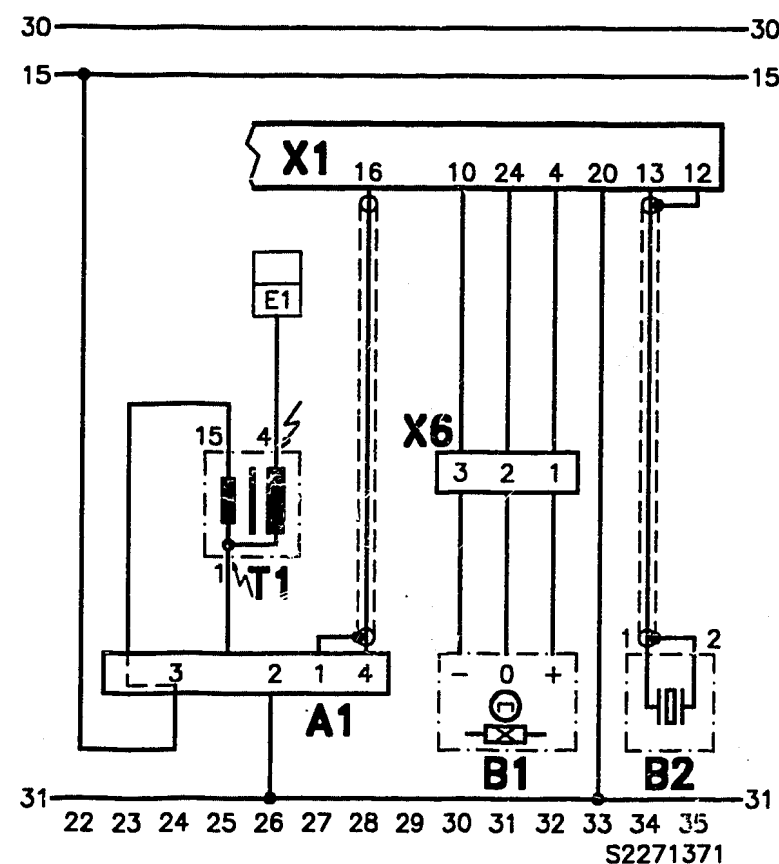
X3 = LH 2.2 Jetronic control-unit plug
 X4 = LH 2.4 Jetronic control-unit plug
 X5 = Diagnosis connection

ELECTRICAL TERMINAL DIAGRAM

Vehicle with pulse generator in ignition distributor or at crankshaft.

K21 ————— ==>

K22 ————— <==

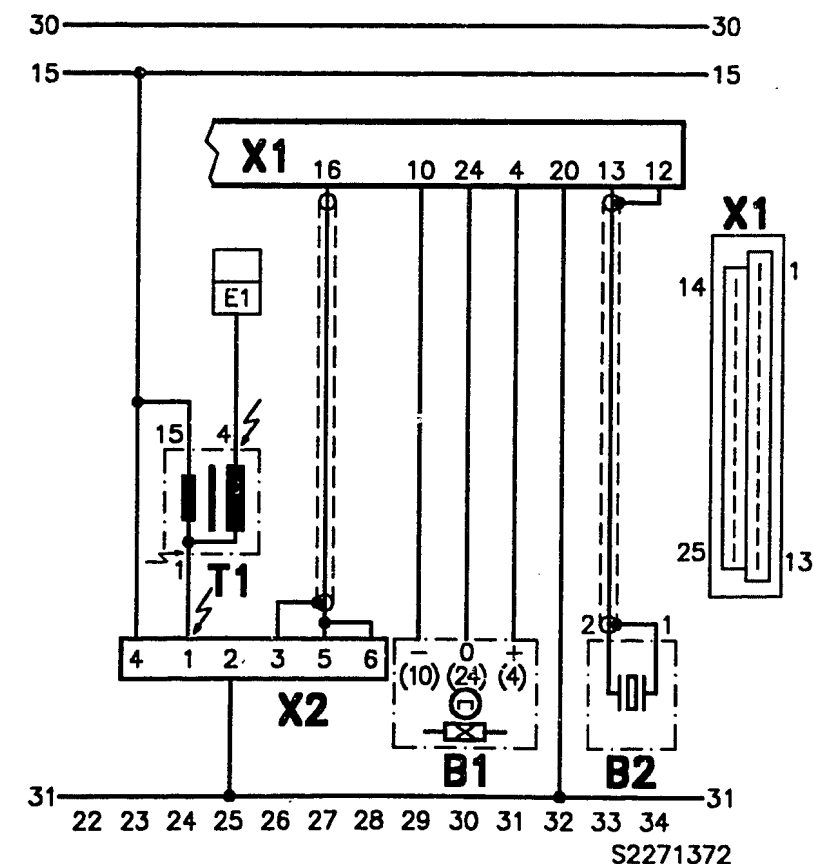


H.T. arrows: Caution 400 V...25 kV

A1 = Trigger box
 B1 = Magnetic pulse generator
 B2 = Knock sensor
 E1 = to ignition/H.T. distributor
 T1 = Ignition coil
 X1 = EI-K control-unit plug
 X6 = Magnetic-pulse-generator plug connection

ELECTRICAL TERMINAL DIAGRAM (CONTINUED)

Vehicle with pulse generator at crankshaft
 and ignition-coil/trigger-box combination ... 055.

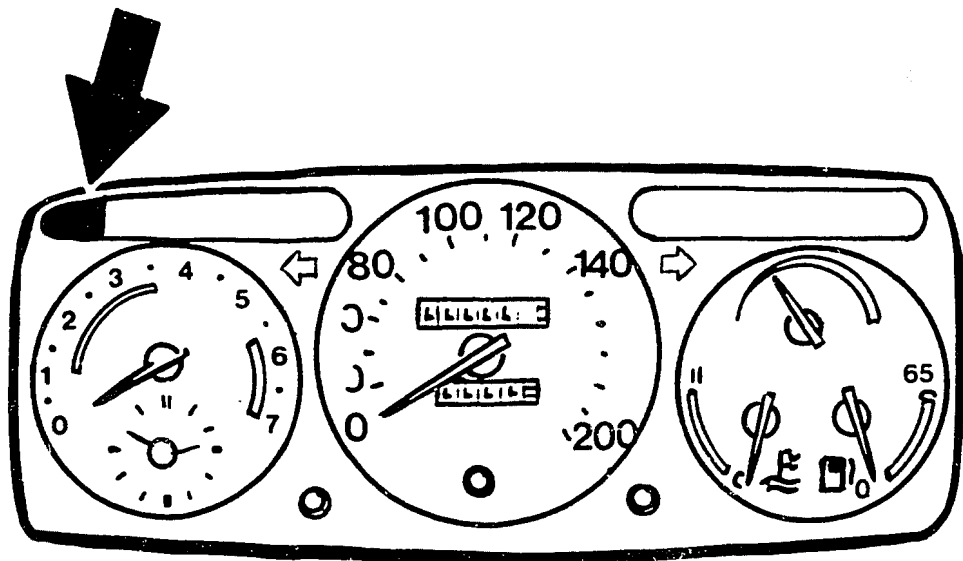


H.T. arrows: caution 400 V...25 kV

B1 = Magnetic pulse generator
 B2 = Knock sensor
 E1 = to ignition/H.T. distributor
 T1 = Ignition coil
 X1 = EI-K control-unit plug
 X2 = Trigger-box plug

ELECTRICAL TERMINAL DIAGRAM (CONTINUED)

Vehicle with pulse generator in ignition
 distributor and separate trigger box ...124.

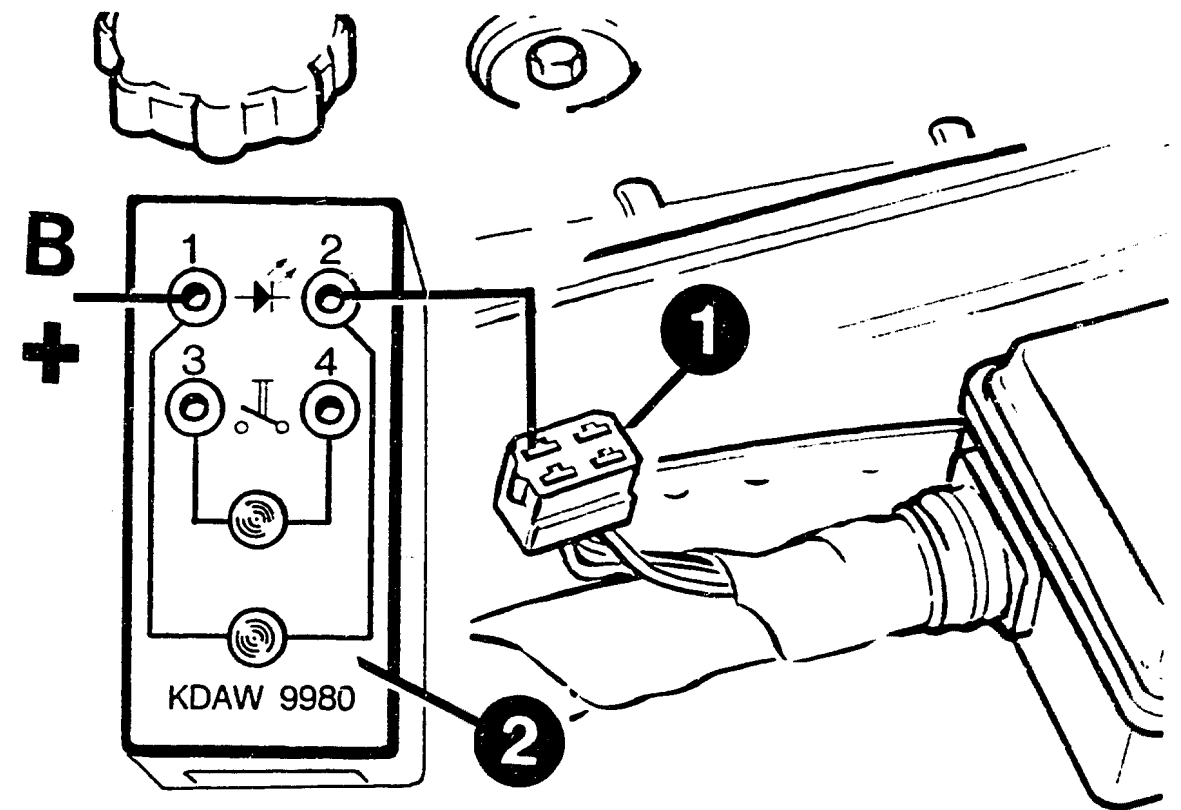


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Saab 900i 16

INSTALLATION POSITION OF COMPONENTS

Fault lamp (CHECK ENGINE) is located in instrument panel above rev counter, top left (arrow).



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Saab 900i 16

1 = Diagnosis connection

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The diagnosis connection is located at the wiring harness on the central-electrics console.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Saab 900i 16

The ignition-coil/trigger-box combination ... 055 is located at the right-hand inner fender.

Trigger box ... 124 and EI-K control unit are installed between left-hand inner fender and engine bulkhead.

LH-Jetronic control unit is located in footwell on right, behind side trim.

The knock sensor is located at the engine block, beneath the intake passages (2 and 3).

Three-pole plug connection for crankshaft magnetic pulse generator is fitted beneath throttle-valve section.

The magnetic pulse generator is installed between engine and crankshaft pulley.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Removal and installation instructions for magnetic pulse generator:

REMOVAL:

Remove V-belt and drive belt.

Unscrew fastening screw of V-belt pulley.

Detach V-belt pulley by hand.

Unscrew magnetic pulse generator.

INSTALLATION:

Apply Loctite to screws of magnetic pulse generator.

Screw first screw into round hole in magnetic pulse generator; then secure opposite side.

Attach V-belt pulley (pay attention to vee) and tighten to 190 Nm.

Fit V-belt and drive belt.

Trouble-shooting instructions : SAA-5005
BOSCH system : EI-K
Make of vehicle : SAAB
Basic microcard : KFZ-00..

TABLE OF CONTENTS

Section	Coordinate
Special features, usage, safety	02
Trouble-shooting chart	05
Self-diagnosis test table	07
Rapid diagnosis chart	09
Test specifications	17
Electrical terminal diagram	19
Installation position of components, removal and installation instructions	23

SPECIAL FEATURES

These brief instructions, valid at the time of publication, apply to the following Saab models:

Saab 900i 16, EU/US 05.85 ->
Engine B 202i 2.0 l / 4 cyl.

Saab 9000i 16, EU/US 09.86 ->
Engine B 202i 2.0 l / 4 cyl.

- * Electronic ignition system with self-diagnosis (knock control only)
- * Self-diagnosis with single-digit flashing code.

N o t e :
In the case of vehicles with LH 2.2 - Jetronic, the fault lamp may light up continuously with the engine on. This is an indication of LH-Jetronic emergency operation.

In the case of vehicles with LH 2.4 - Jetronic, the fault lamp indicates ignition and Jetronic faults.

- * Activation of self-diagnosis and flashing-code evaluation by way of evaluation unit KDAW 9980.

Activation:
Start engine and run briefly at > 1000 min⁻¹ ; then allow engine to idle.
The flashing code is output only when idling with the idle contact closed and is repeated until the ignition is switched off.

SPECIAL FEATURES (CONTINUED)

- * Acceleration knock in lower part-load range.
Reason:
Short to ground in load-signal lead. This results in the ignition angle already being advanced in the lower engine-speed range.
Vehicles up to mid '88 with the EI-K control units listed here do not detect this fault.
- * EI-K control unit 0 227 400 022
 0 227 400 104
 0 227 400 126
Installed in vehicles with LH 2.2-Jetronic
(control unit, 25 pole)
- * EI-K control unit 0 227 400 127
Installed in vehicles with LH 2.4-Jetronic
(control unit, 35 pole; thus other pin assignment)
- * Trigger box 0 227 100 124
(with current limitation).
- * Ignition distributor 0 237 506 ...
- * Ignition coil 0 221 122 327
- * Knock sensor 0 261 231 001
(old version)
- * Knock sensor 0 261 231 006
(new version)
- * Saab 900i:
Vehicles as of model year 86 are equipped with a fault lamp in the instrument panel and an ignition-pulse amplifier.
As of model year 88 there is no ignition-pulse amplifier and the EI-K control unit term. 17 is connected directly to the LH-Jetronic control unit term. 1.
- * Saab 900Gi:
Vehicles as of model year 87 are equipped with a fault lamp in the instrument panel and an ignition-pulse amplifier.
As of model year 88 there is no ignition-pulse amplifier and the EI-K control unit term. 17 is connected directly to the LH-Jetronic control unit term. 1.

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.
For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!
High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on.
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

											Cause (component fault)
*	*	*	*	*	*	*	*	*	*	*	Self-diagnosis
*		*	*	*	*	*					H.T. end
*		*	*	*	*						Ignition coil
*		*									Firing sequence
*											Ignition-distributor as-installed setting
*											Voltage, EI-K control unit
*											Voltage, trigger box
*											Voltage, primary circuit
*											Ignition-distributor plug and socket
*											Magnetic-pulse-generator voltage supply
*											Magnetic-pulse-generator function
*											EI-K control-unit function
*											Engine-speed signal, LH-Jetronic

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

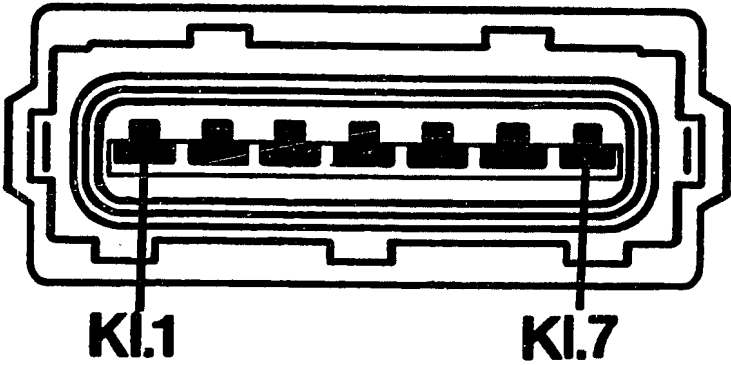
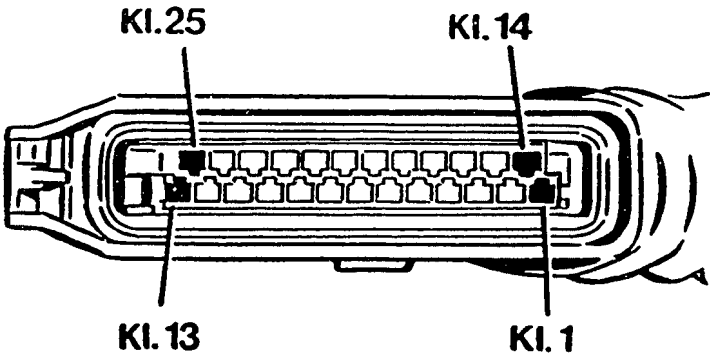
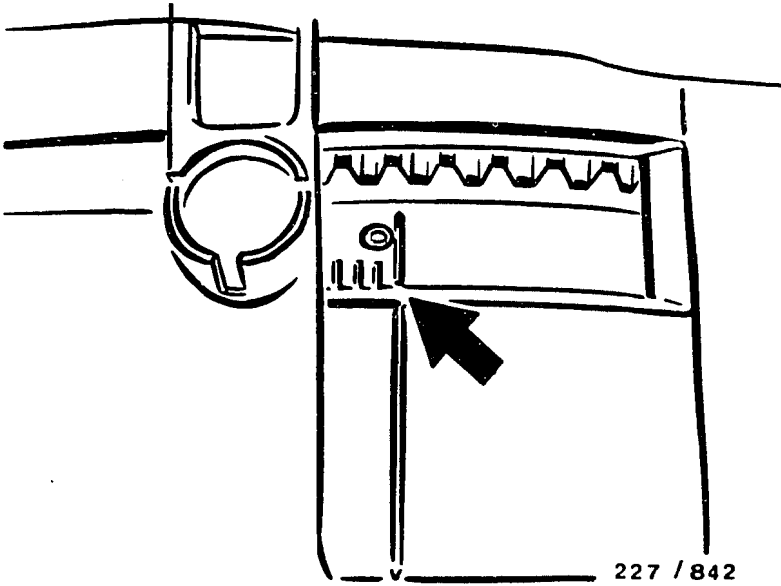
								Cause (component fault)
*								Contact resistances
*								Primary signal
							*	Fault lamp
						*	*	Throttle-valve-switch idle contact
	*	*		*	*	*	*	Basic ignition setting
								Peak-coil-current cutoff
			*					Voltage, trigger box (engine idling)
			*					Voltage, ignition coil (engine idling)
			*					Primary voltage (engine idling)

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Cause of trouble	Test instructions	Termi- nals	Set values
4	Knock sensor	Visual inspection, knock-sensor-plug oxidation. Tightening torque for 0 261 231 001 for 0 261 231 006 Internal resistance for 0 261 231 001 for 0 261 231 006	12 13 12 13	11...15 Nm 15...25 Nm 270...330 k Ω infinity Ω
5	LH-Jetronic load signal	Voltage, EI-K control-unit plug with handle cover removed. Engine idling. Briefly accelerate to full throttle.	8 20 (+) (-)	Voltage > 0.1 V Voltage increase

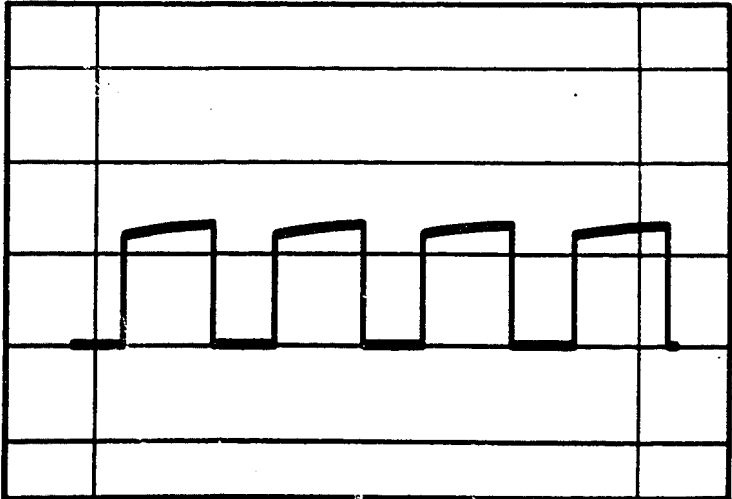
RAPID DIAGNOSIS CHART

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
1	H.T. END Check function (e.g. open circuit, shunt) of for example spark plugs, ignition harness and distributor cap. Assess for example by way of ignition oscillogram, resistance measurement, visual inspection.	—	—
2	IGNITION COIL Visual inspection: plug present, sealing compound oozed out? Resistance, primary. Resistance, secondary.	1 15 1 4	0,6... 1,0 Ω 6,4...11,1 k Ω
3	IGNITION-DISTRIBUTOR AS-INSTALLED SETTING Engine cyl. 1 on TDC in compression stroke. See top picture. (Arrow = TDC mark) Distributor rotor points to mark on housing.	—	—
4	VOLTAGE, EI-K CONTROL-UNIT PLUG Detach EI-K control-unit plug. Voltage, EI-K control-unit plug. See center picture. Ignition ON.	6 20 (+) (-)	Battery voltage
5	VOLTAGE, TRIGGER BOX Detach trigger-box plug. Voltage, trigger-box plug. See bottom picture. Ignition ON.	4 2 (+) (-)	Battery voltage
6	VOLTAGE, PRIMARY CIRCUIT Voltage, trigger-box plug. Ignition ON.	1 2 (+) (-)	Battery voltage

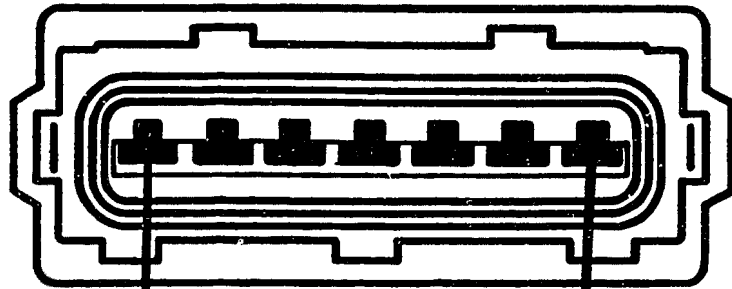


RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
7	IGNITION-DISTRIBUTOR PLUG AND SOCKET Visual inspection, ignition-distributor plug and socket, "oxidation"	—	—
8	MAGNETIC-PULSE-GENERATOR VOLTAGE SUPPLY Attach ignition-distributor and EI-K control-unit plug. Voltage, ignition-distributor plug. Ignition ON.	4 10 (+) (-)	equal to/greater than 10 V
9	MAGNETIC-PULSE-GENERATOR FUNCTION Ignition-distributor plug attached. Oscilloscope "Special" to ignition-distributor plug and vehicle ground. Actuate starting motor. See top picture.	24 B- (+) (-)	Rectangular pulse
10	EI-K CONTROL-UNIT FUNCTION Oscilloscope "Special" to trigger-box plug. See bottom picture. Actuate starting motor. See top picture.	5 B- 6 B- (+) (-)	Rectangular pulse
11	ENGINE-SPEED SIGNAL (LH-Jetronic) Ignition OFF. Detach LH-Jetronic control-unit plug. Oscilloscope "Special" to LH-Jetronic control-unit plug. Actuate starting motor. See top picture.	1 B- (+) (-)	Rectangular pulse



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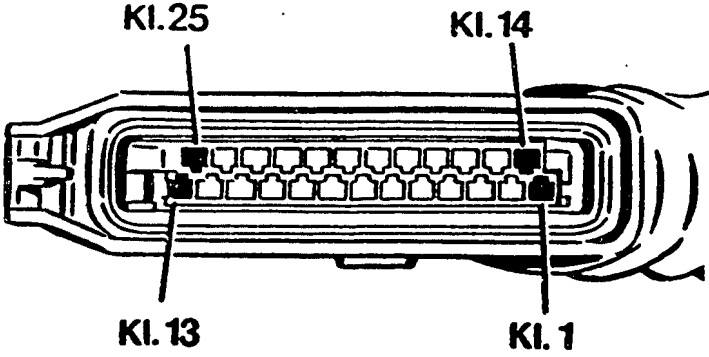
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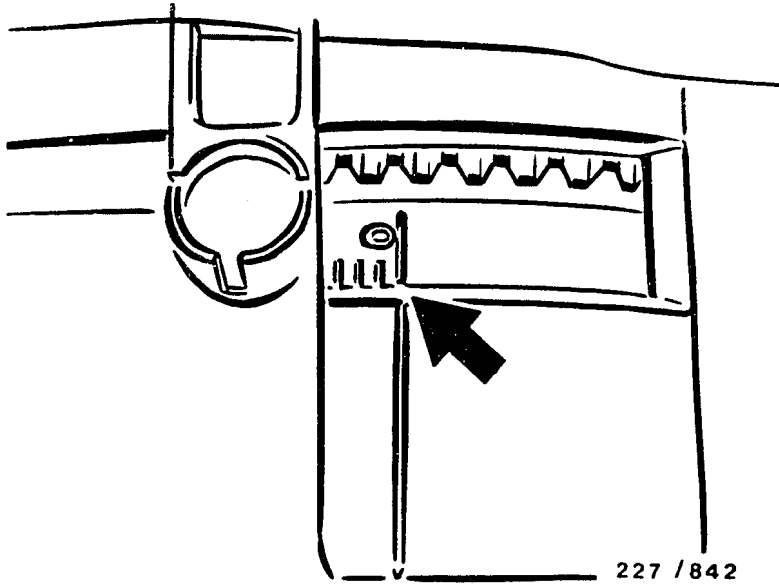
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RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
12	CONTACT RESISTANCES (primary side) Detach negative and positive lead of battery. Switch on ignition. Resistance between battery terminal and trigger-box plug. Resistance between batt. term. and ign. coil. Resistance between trigger-box plug and ignition coil	 B+ 4 B- 2 B+ 15 1 1	 max. 0.3 Ω max. 0.3 Ω
13	PRIMARY SIGNAL Attach trigger-box plug. Oscilloscope/engine-speed tester to ign. coil. Actuate starting motor.	 15 1 (+) (-)	 Primary voltage/ engine-speed indication (magnitude irrele- vant)
14	THROTTLE-VALVE-SWITCH IDLE CONTACT Throttle-valve idle setting. Resistance, EI-K control-unit plug. Open throttle valve approx. 2°. Resistance, EI-K control-unit plug. See top picture.	 20 7 20 7	 0 Ω infinity Ω
15	IGNITION BASIC SETTING Engine idling (at operating temperature). Idle contact closed. Determine ignition angle. See bottom picture. (Arrow = TDC mark)		 14 \pm 1° BTDC at 800...900 min ⁻¹



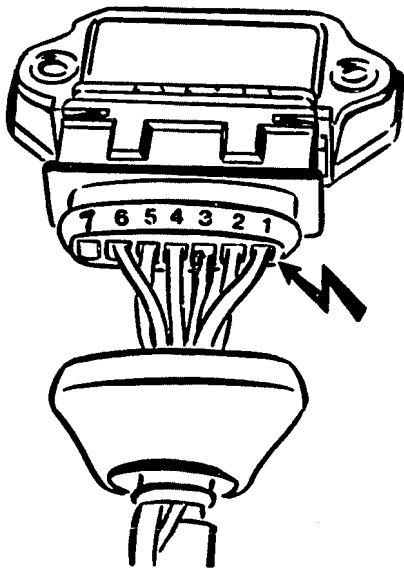
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RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Terminals	Set values
16	PEAK-COIL-CURRENT CUTOFF Voltage, ignition coil. Ignition ON.	15 1 (+) (-)	0 V, or after approx. 1 s 0 V.
17	VOLTAGE, TRIGGER BOX Push back rubber sleeve at trigger-box plug. Voltage at trigger-box plug. See top picture. Engine idling.	4 2 (+) (-)	12...14 V, max. 1 V below U _B
18	VOLTAGE, IGNITION COIL Voltage, ignition coil and battery. Engine idling.	15 B- (+) (-)	equal to/greater than 10 V
19	PRIMARY VOLTAGE Oscilloscope with pulse-shaping circuit to ignition coil. Engine idling. See bottom picture.	15 1 15 1 (+) (-)	295...365 V



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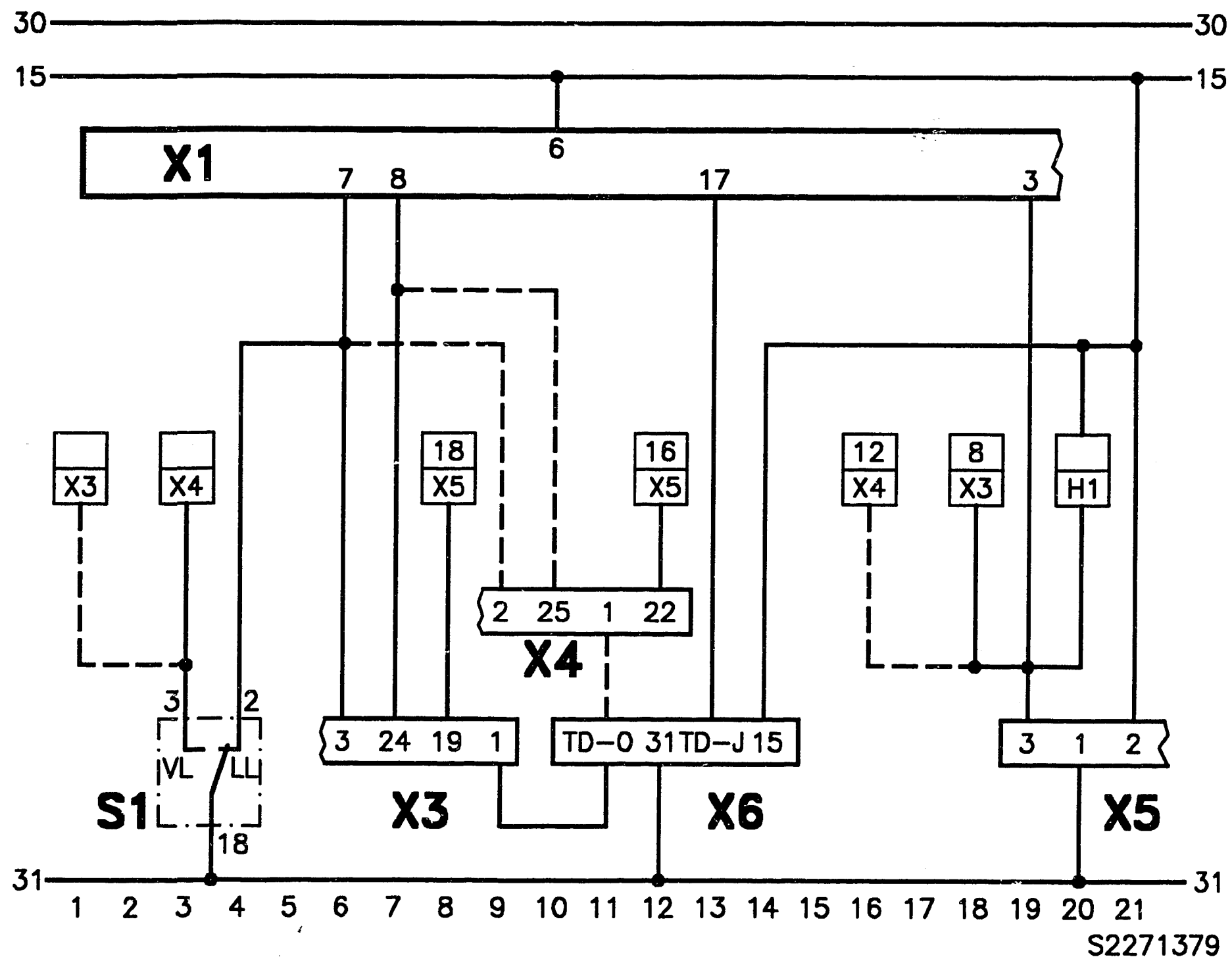
TEST SPECIFICATIONS

Ignition coil, primary	0,6... 1,0 Ω
secondary	6,4...11,1 k Ω
Voltage, EI-K control unit with ignition ON	Battery voltage
Voltage, trigger box with ignition ON	Battery voltage
Voltage, primary circuit with ignition ON	Battery voltage
Voltage supply Magnetic pulse generator with ignition ON	Equal to/greater than 10 V
Magnetic-pulse-generator function at cranking speed	Rectangular pulse
EI-K control-unit function at cranking speed	Rectangular pulse
Engine-speed signal, LH-Jetronic at cranking speed	Rectangular pulse
Primary signal at cranking speed	Primary voltage/ engine-speed indication
Throttle-valve-switch idle contact	
Throttle valve closed	0 Ω
Throttle valve open approx. 2°	Infinity Ω
Peak-coil-current cutoff with ignition ON	0 V, or after approx. 1 s 0 V.

TEST SPECIFICATIONS (CONTINUED)

Tightening torque, knock sensor	
0 261 231 001	11...15 Nm
0 261 231 006	15...25 Nm
Internal resistance, knock sensor	
0 261 231 001	270...330 k Ω
0 261 231 006	infinity Ω
Ignition basic setting at	14 \pm 1° BTDC 800...900 min ⁻¹
Voltage supply EI-K control unit with engine idling	12...14 V max. 1 V below U _B
Voltage, trigger box with engine idling	12...14 V max. 1 V below U _B
Voltage, ignition coil with engine idling	equal to/greater than 10 V
Primary voltage with engine idling	295...365 V

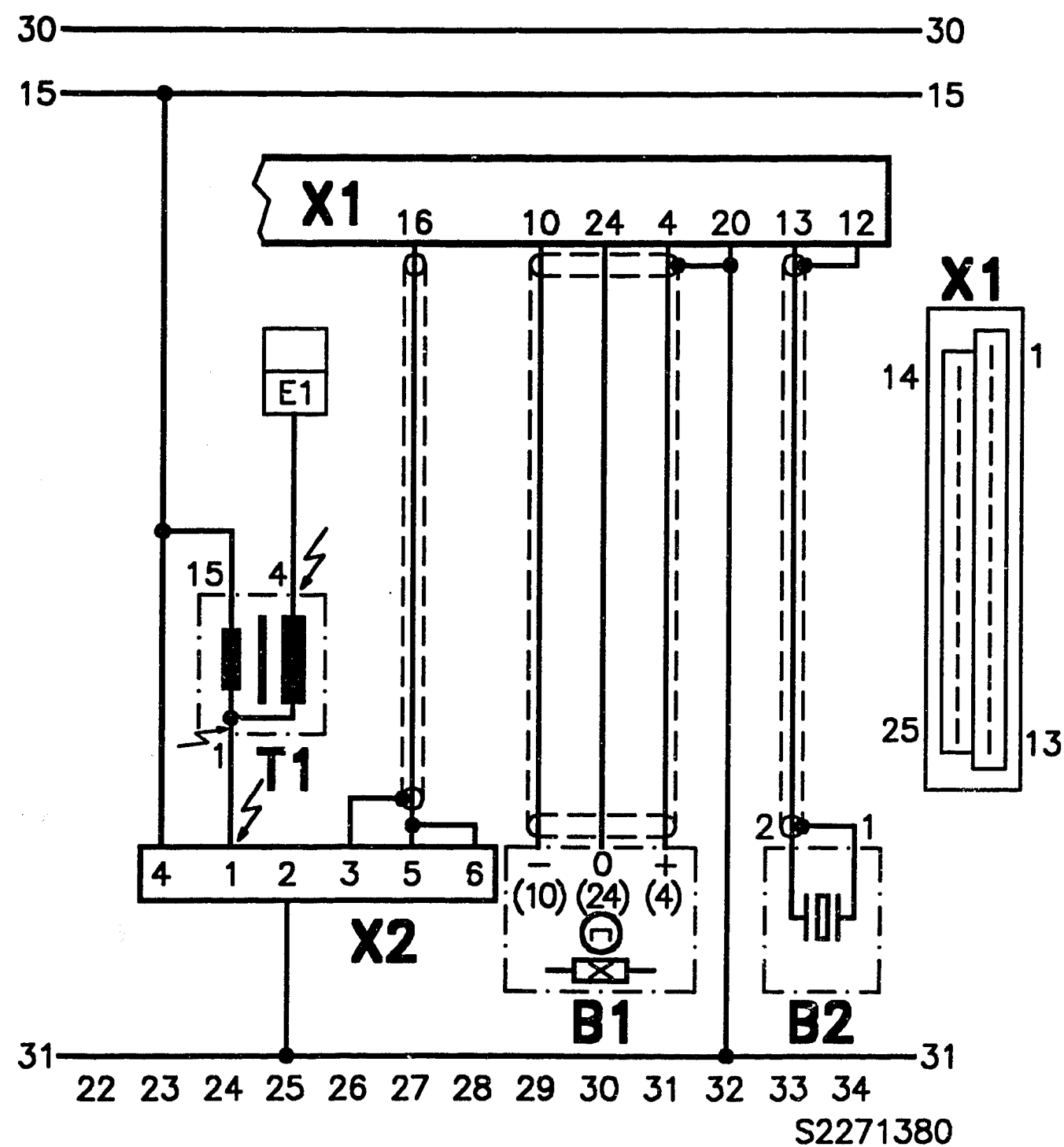
Refer to Autodata test specifications for settings as regards ignition, idle speed, emissions, valve clearance etc.



ELECTRICAL TERMINAL DIAGRAM

H1 = Fault lamp, self-diagnosis
 S1 = Throttle-valve switch
 X1 = EI-K control-unit plug
 X3 = LH 2.2 Jetronic control-unit plug

X4 = LH 2.4 Jetronic control-unit plug
 X5 = Diagnosis connection
 X6 = Ignition-pulse-amplifier plug



ELECTRICAL TERMINAL DIAGRAM (CONTINUED)

H.T. arrows: Caution 400 V...25 kV

B1 = Magnetic pulse generator

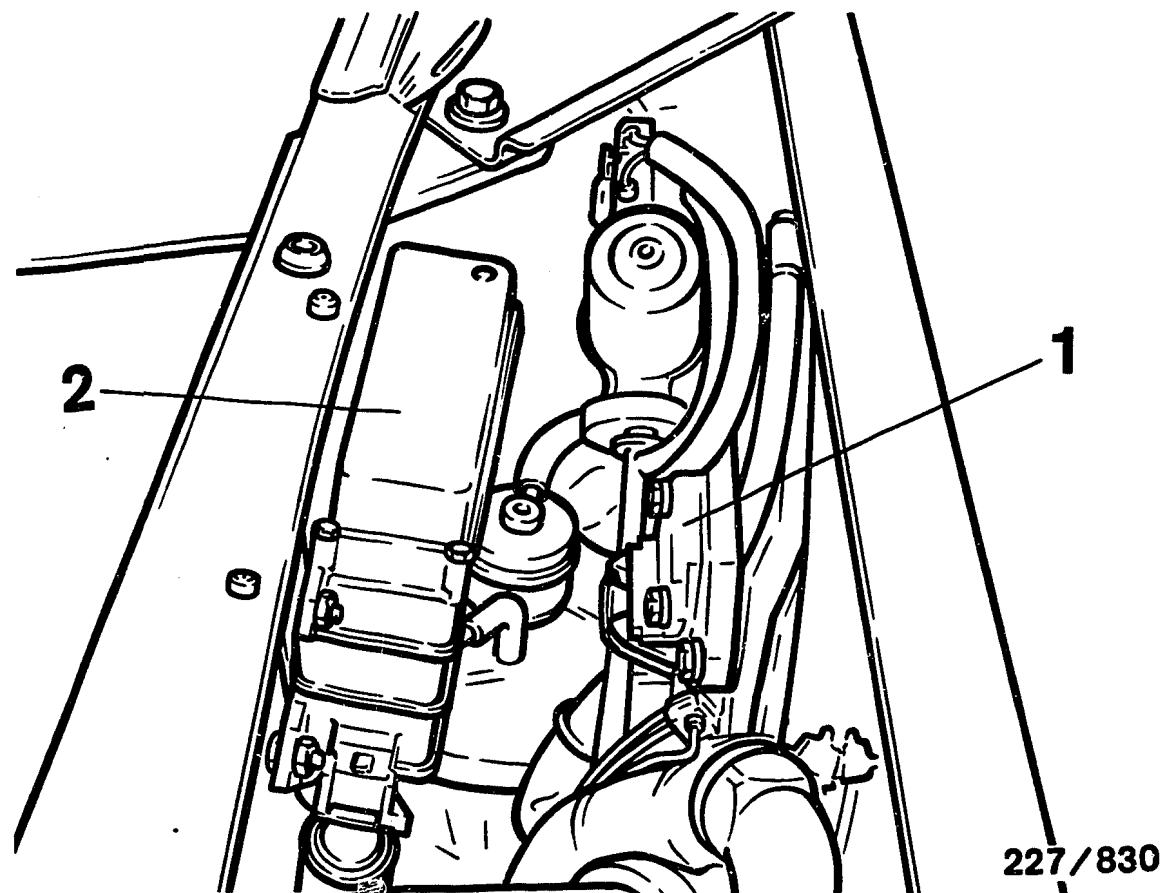
B2 = Knock sensor

E1 = to ignition distributor

T1 = Ignition coil

X1 = EI-K control-unit plug

X2 = Trigger-box plug

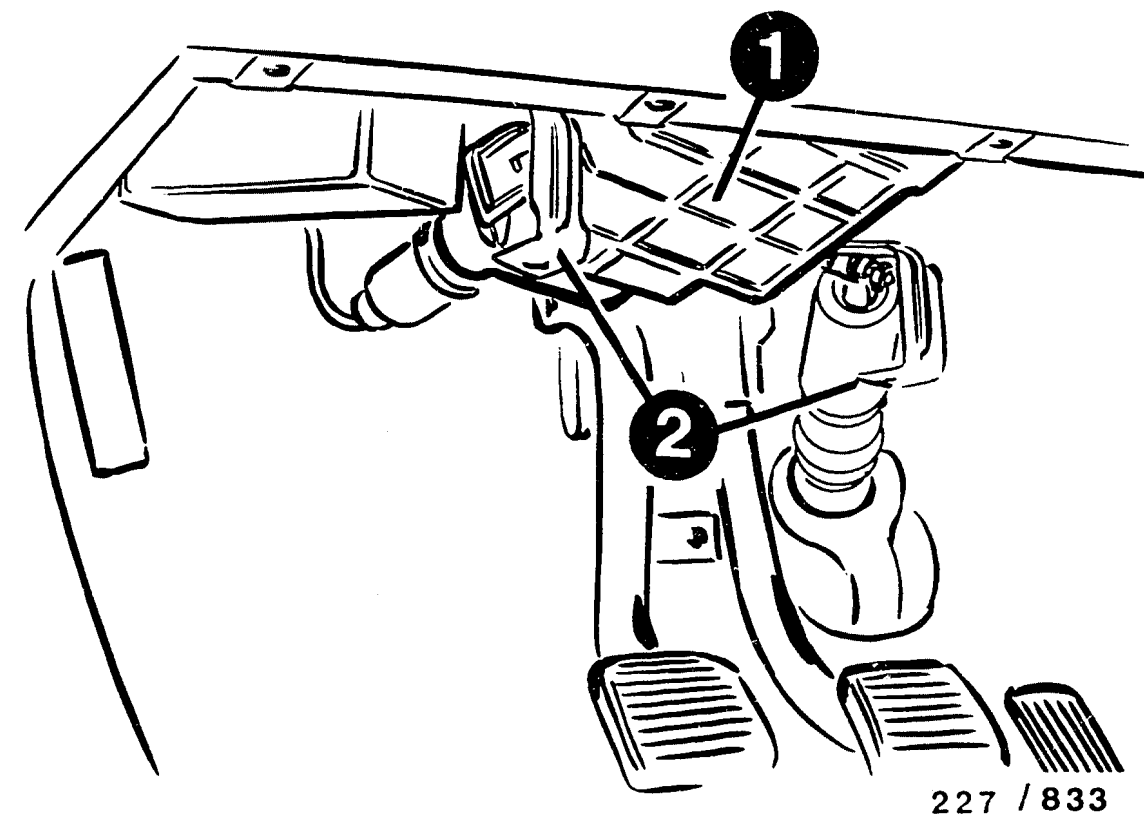


Saab 900i 16

- 1 = Trigger box
- 2 = EI-K control unit

INSTALLATION POSITION OF COMPONENTS

Trigger box and EI-K control unit are located in the engine compartment (wheel house, left).

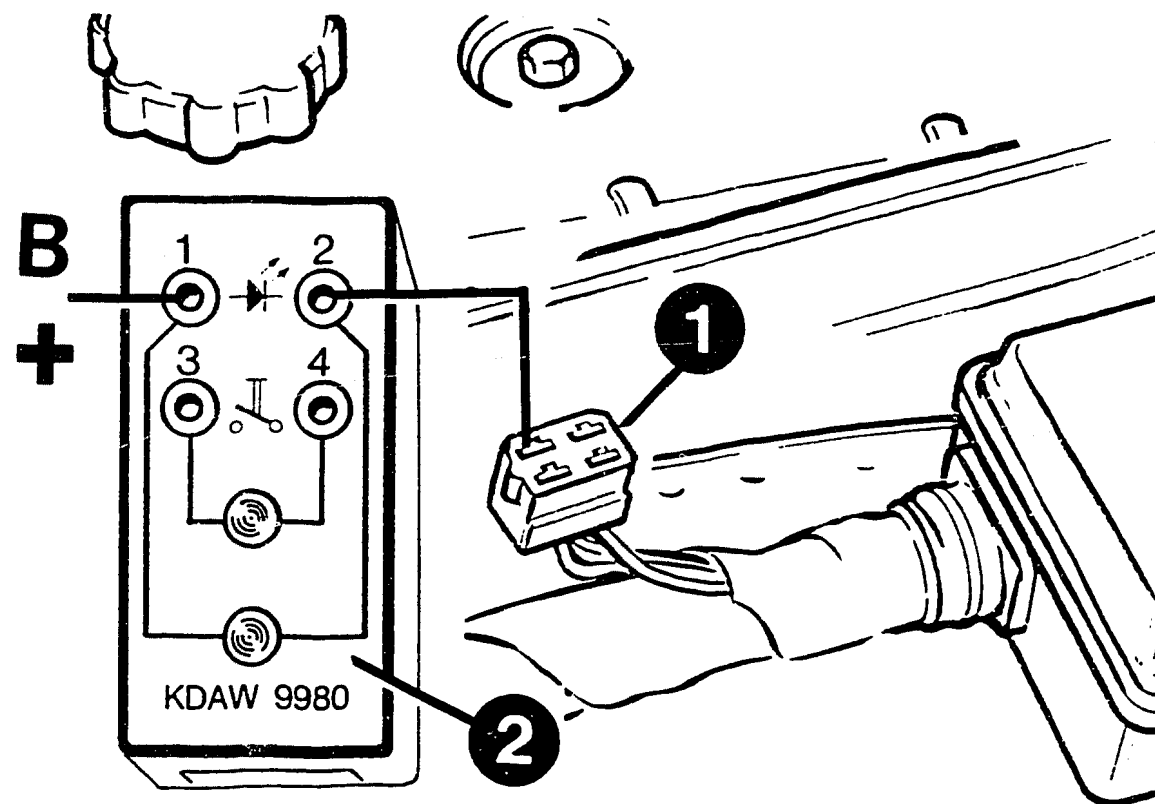


Saab 9000i 16

- 1 = EI-K control unit
- 2 = Bracket

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The EI-K control unit is located in the passenger compartment beneath the instrument panel.



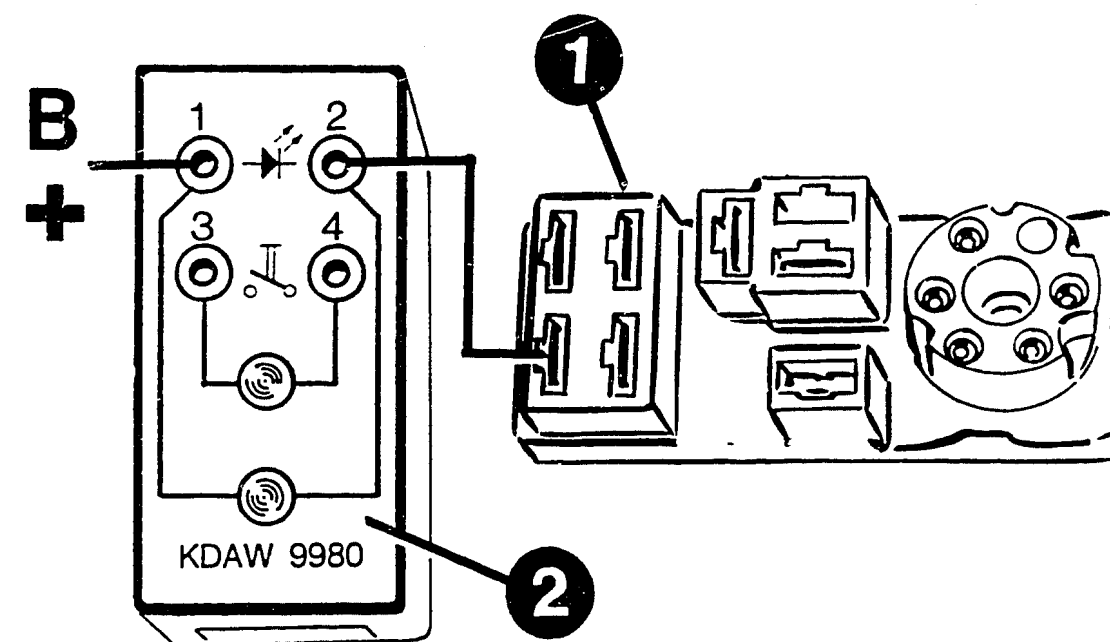
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Saab 900i 16

1 = Diagnosis connection

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The diagnosis connection is located at the wiring harness on the central-electrics console.



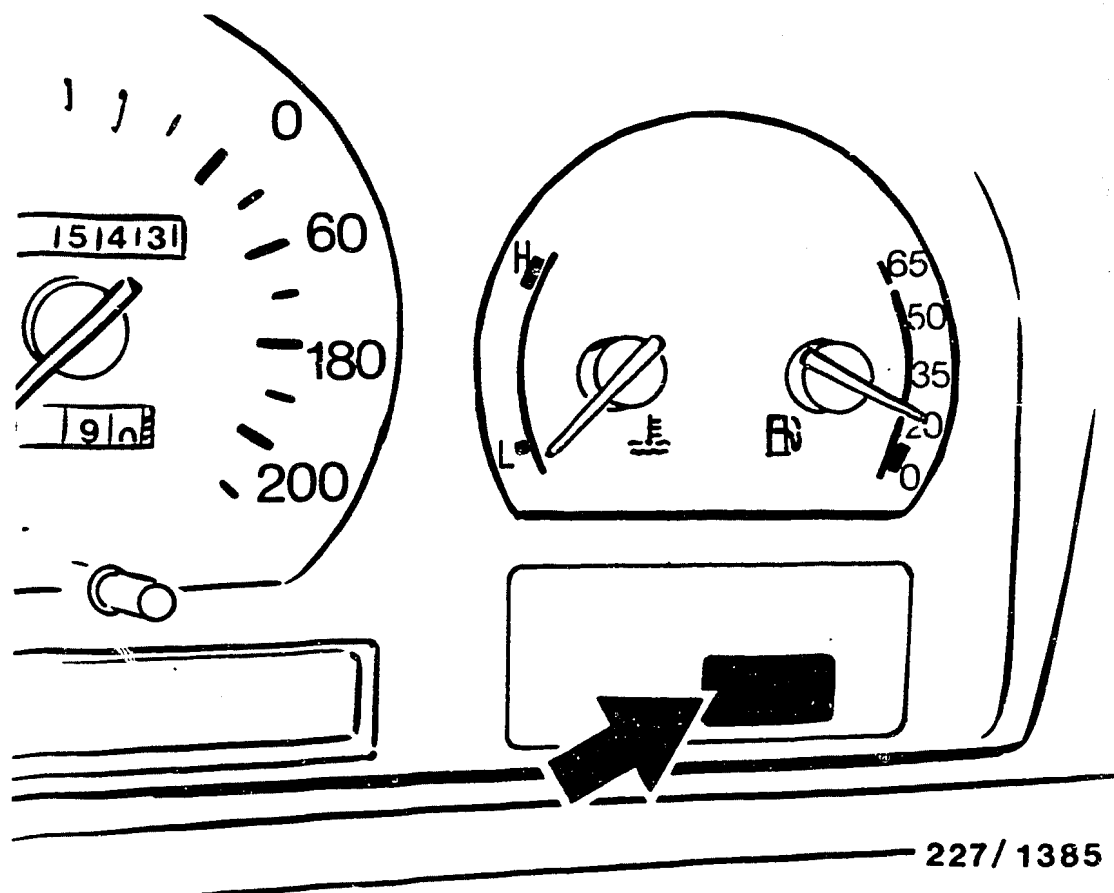
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Saab 9000i 16

1 = Diagnosis connection

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The diagnosis connection is located behind the engine bulkhead on the left-hand wheel box.



Saab 9000i 16

Arrow = Fault lamp in instrument panel
(CHECK ENGINE)

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Saab 900i 16

LH-Jetronic control unit with main and pump relay are located in passenger-side footwell on right behind side trim.

Ignition-pulse amplifier is attached in central-electrics console to left-hand wheel house at relay position D.

Saab 9000i 16

Ignition trigger box is attached to a heat sink at left-hand wheel house.

LH-Jetronic control unit is located in plenum chamber behind engine bulkhead.

Ignition-pulse amplifier is attached behind glove compartment in central-electrics console at relay position J.

Trouble-shooting instructions : SAA-5006
BOSCH system : EI-K
Make of vehicle : SAAB
Basic microcard : KFZ-00..

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SPECIAL FEATURES

These brief instructions, valid at the time of publication, apply to the following Saab model:

Saab 9000i 16, EU/US 09.87 ->
Engine B 202i 2.0 l / 4 cyl.

- * Electronic ignition system with self-diagnosis (knock control only)
- * Fault lamp for self-diagnosis is located in instrument panel.
- * Self-diagnosis with single-digit flashing code.

N o t e :

In the case of vehicles with LH 2.2 - Jetronic, the fault lamp may be permanently lit with the engine on. This is an indication of LH-Jetronic emergency operation.

In the case of vehicles with LH 2.4 - Jetronic, the fault lamp indicates ignition and Jetronic faults.

- * Activation of self-diagnosis and flashing-code evaluation by way of evaluation unit KDAW 9980.

Activation:

Start engine and run briefly at $> 1000 \text{ min}^{-1}$; then allow engine to idle.
The flashing code is output only when idling with the idle contact closed and is repeated until the ignition is switched off.

SPECIAL FEATURES (CONTINUED)

- * Acceleration knock in lower part-load range.

Reason:

Short to ground in load-signal lead; as a result the ignition angle is already advanced in the lower engine-speed range.

Vehicles up to mid '88 with the EI-K control units listed here do not detect this fault.

- * EI-K control unit 0 227 400 129
 0 227 400 130

with additional fault code 3 (knock detection).
Installed in vehicles with LH 2.2-Jetronic
(control unit, 25 pole)

- * EI-K control unit 0 227 400 150
with additional fault code 3 (knock detection).
Installed in vehicles with LH 2.4 Jetronic
(control unit, 35 pole; thus other pin assignment)

- * Trigger box 0 227 100 124
(with current limitation).

- * Ignition coil 0 221 122 327

- * H.T. distributor 0 237 501 ...

- * Hall generator (non-Bosch) is fitted on crankshaft.

- * Knock sensor 0 261 231 006

- * With no ignition-pulse amplifier

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.

For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!

High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on.
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

Cause (component fault)										
*	*	*	*	*	*	*	*	*	*	Self-diagnosis
*		*	*	*	*	*				H.T. end
*		*	*	*	*					Ignition coil
*		*								Firing sequence
*										H.T. distributor
										As-installed setting
*										Voltage, EI-K control unit
*										Voltage, trigger box
*										Voltage, primary circuit
*										Magnetic-pulse-generator plug connection
*										Magnetic-pulse-generator voltage supply
*										Magnetic-pulse-generator function
*										EI-K control-unit function
*										Engine-speed signal, LH-Jetronic

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on (dieseling).
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

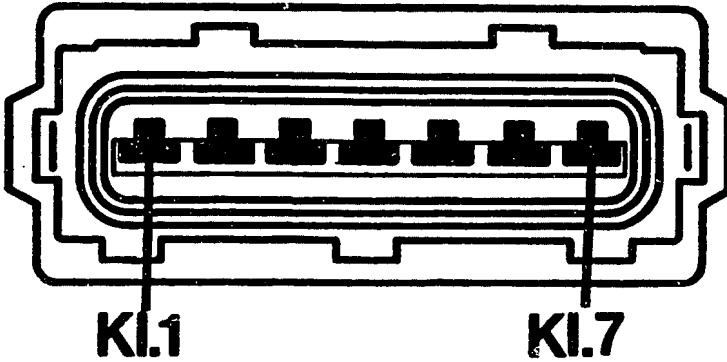
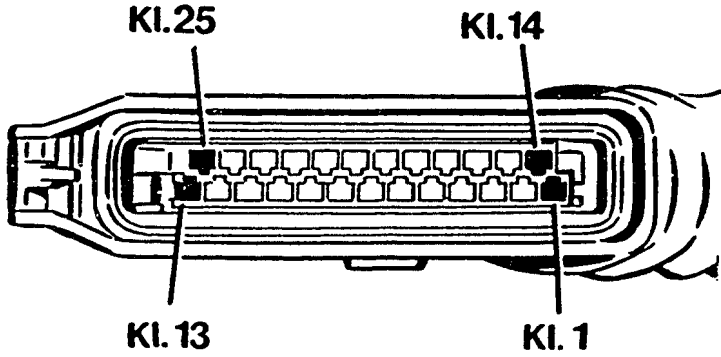
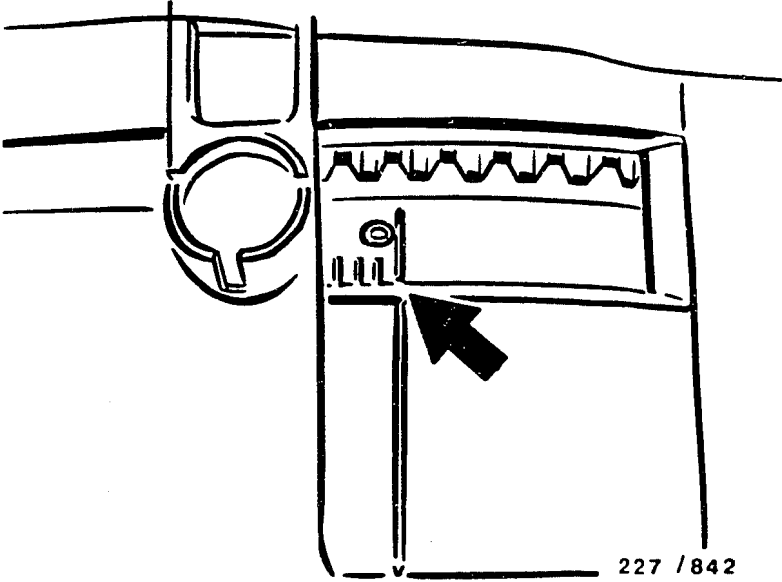
Cause (component fault)										
*										Contact resistances
*										Primary signal
								*		Fault lamp
								*		Throttle-valve-switch idle contact
			*							Peak-coil-current cutoff
			*							Voltage, trigger box (engine idling)
			*							Voltage, ignition coil (engine idling)
			*							Primary voltage (engine idling)

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Cause of trouble	Test instructions	Terminals	Set values
3	Knock detection	EI-K control unit defective.	—	—
4	Knock sensor	Visual inspection: Leads and knock-sensor plug (oxidation) Tightening torque 0 261 231 006 Internal resistance 0 261 231 006 (If no fault is established, the cause of the problem may be in the EI-K control unit.)	12 13	15...25 Nm infinity Ω
5	LH-Jetronic load signal	Voltage, EI-K control-unit plug with handle cover removed. Engine idling. Briefly accelerate to full throttle.	8 20 (+) (-)	Voltage > 0.1 V Voltage increase

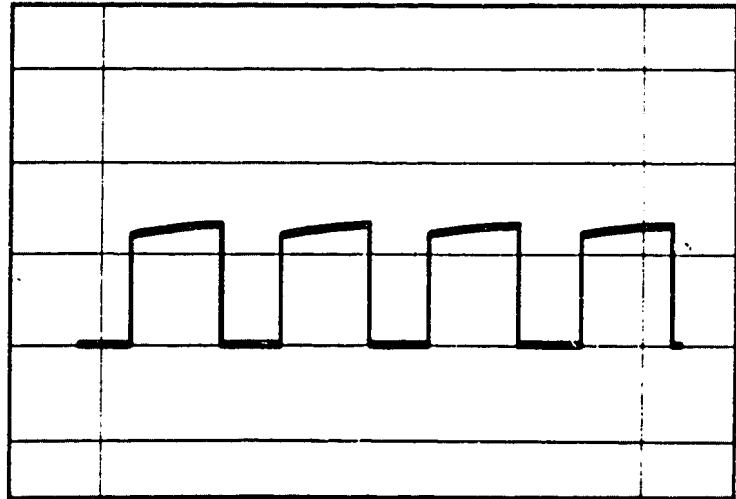
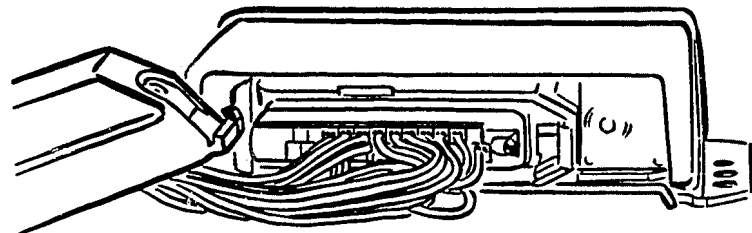
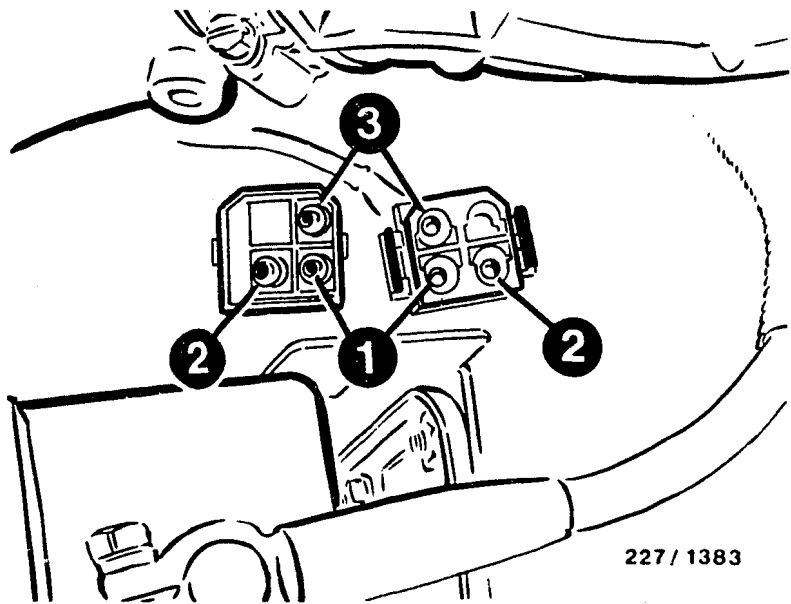
RAPID DIAGNOSIS CHART

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
1	H.T. END Check function (e.g. open circuit, shunt) of for example spark plugs, ignition harness and distributor cap. Assess for example by means of ignition oscillogram, resistance measurement, visual inspection.	—	—
2	IGNITION COIL Visual inspection: plug present, sealing compound oozed out? Resistance, primary. Resistance, secondary.	1 15 1 4	0,6... 1,0 Ω 6,4...11,1 k Ω
3	H.T. DISTRIBUTOR – AS-INSTALLED SETTING Engine cyl. 1 at TDC in compression stroke. See top picture. (Arrow = TDC mark) Distributor rotor points to mark on housing.	—	—
4	VOLTAGE, EI-K CONTROL-UNIT PLUG Detach EI-K control-unit plug. Voltage, EI-K control-unit plug. See center picture. Ignition ON.	6 20 (+) (-)	Battery voltage
5	VOLTAGE, TRIGGER BOX Detach trigger-box plug. Voltage, trigger-box plug. See bottom picture. Ignition ON.	4 2 (+) (-)	Battery voltage
6	VOLTAGE, PRIMARY CIRCUIT Voltage, trigger-box plug. Ignition ON.	1 2 (+) (-)	Battery voltage



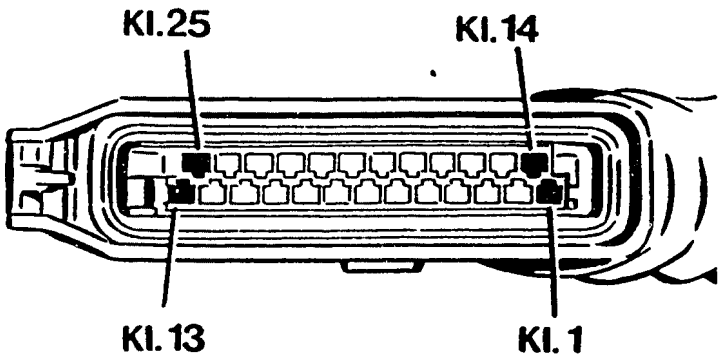
RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
7	MAGNETIC-PULSE-GENERATOR PLUG CONNECTION Visual inspection, magnetic-pulse-generator plug connection. "Oxidation" See top picture.	—	—
8	MAGNETIC-PULSE-GENERATOR VOLTAGE SUPPLY Voltage, magnetic-pulse-generator plug Ignition ON.	1 3 (+) (-)	equal to/greater than 10 V
9	MAGNETIC-PULSE-GENERATOR FUNCTION Magnetic-pulse-generator plug connected. Remove handle cover from EI-K control-unit plug. See center picture Oscilloscope "Special" to EI-K control-unit plug and vehicle ground. Actuate starting motor. See bottom picture.	24 B- (+) (-)	Rectangular pulse
10	EI-K CONTROL-UNIT FUNCTION Ignition OFF Oscilloscope "Special" to detached trigger-box plug. Actuate starting motor. See bottom picture.	5 B- 6 B- (+) (-)	Rectangular pulse
11	ENGINE-SPEED SIGNAL (LH-Jetronic) Ignition OFF. Detach LH-Jetronic control-unit plug. Oscilloscope "Special" to LH-Jetronic control-unit plug. Actuate starting motor. See bottom picture.	1 B- (+) (-)	Rectangular pulse



RAPID DIAGNOSIS CHART (CONTINUED)

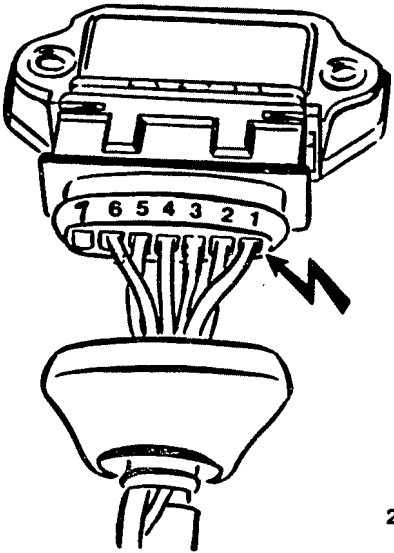
Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
12	CONTACT RESISTANCES (primary side) Detach negative and positive lead of battery. Switch on ignition. Resistance between battery terminal and trigger-box plug. Resistance between battery terminal and ignition coil. Resistance between trigger-box plug and ignition coil	 B+ 4 B- 2 B+ 15 1 1 1 1	 max. 0.3 Ω max. 0.3 Ω
13	PRIMARY SIGNAL Attach trigger-box plug. Oscilloscope/engine-speed tester to ignition coil. Actuate starting motor.	 15 1 (+) (-)	 Primary voltage/ engine-speed indica- tion (magnitude irrelevant)
14	THROTTLE-VALVE-SWITCH IDLE CONTACT Throttle-valve idle position. Resistance, EI-K control-unit plug. Open throttle valve approx. 2°. Resistance, EI-K control-unit plug. (LH-Jetronic control-unit plug detached) See top picture.	 20 7 20 7	 0 Ω infinity Ω



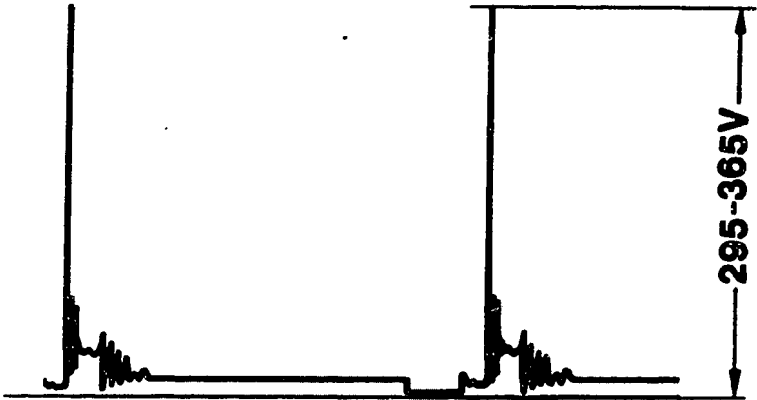
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RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
15	PEAK-COIL-CURRENT CUTOFF Voltage, ignition coil. Ignition ON.	15 1 (+) (-)	0 V, or after approx. 1 s 0 V
16	VOLTAGE, TRIGGER BOX Push back rubber sleeve at trigger-box plug. Voltage at trigger-box plug. See top picture. Engine idling.	4 2 (+) (-)	12...14 V, max. 1 V below U _B
17	VOLTAGE, IGNITION COIL Voltage, ignition coil and battery. Engine idling.	15 B- (+) (-)	equal to/greater than 10 V
18	PRIMARY VOLTAGE Oscilloscope with pulse-shaping circuit to ignition coil. Engine idling. See bottom picture.	15 1 (+) (-)	295...365 V



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227/0024

TEST SPECIFICATIONS

Ignition coil, primary secondary	0,6... 1,0 Ω 6,4...11,1 k Ω
Voltage, EI-K control unit with ignition ON	Battery voltage
Voltage, trigger box with ignition ON	Battery voltage
Voltage, primary circuit with ignition ON	Battery voltage
Voltage supply Magnetic pulse generator with ignition on	equal to/greater than 10 V
Magnetic-pulse-generator function at cranking speed	Rectangular pulse
EI-K control-unit function at cranking speed	Rectangular pulse
Engine-speed signal, LH-Jetronic at cranking speed	Rectangular pulse
Primary signal at cranking speed	Primary voltage/engine- speed indication
Throttle-valve-switch idle contact Throttle valve closed Throttle valve open approx. 2°	0 Ω infinity Ω
Peak-coil-current cutoff with ignition ON	0 V, or after approx. 1 s 0 V.

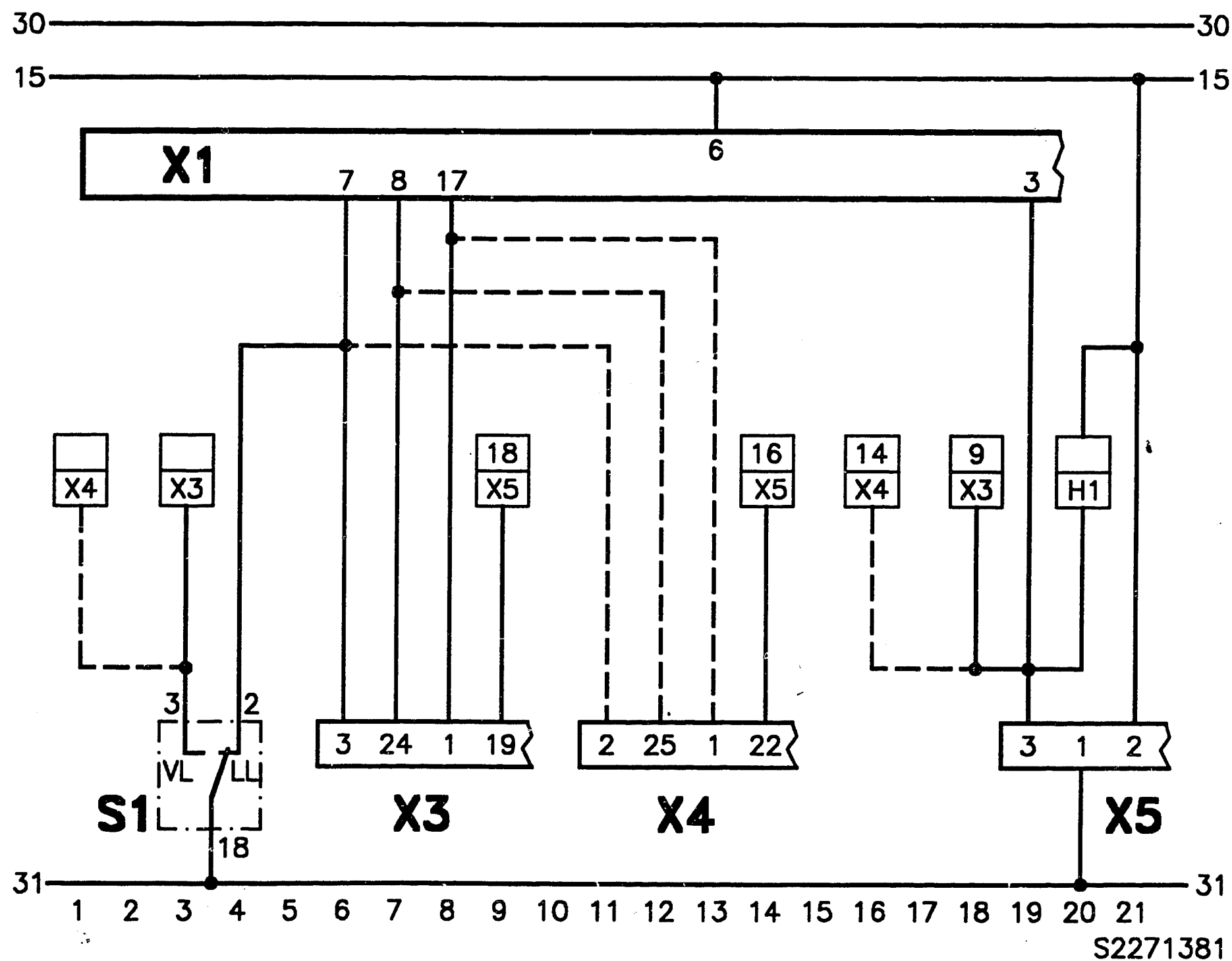
M17

TEST SPECIFICATIONS (CONTINUED)

Tightening torque, knock sensor 0 261 231 006	15...25 Nm
Internal resistance, knock sensor 0 261 231 006	infinity Ω
Voltage supply, EI-K control unit with engine idling	12...14 V max. 1 V below U _B
Voltage, trigger box with engine idling	12...14 V max. 1 V below U _B
Voltage, ignition coil with engine idling	equal to/greater than 10 V
Primary voltage with engine idling	295...365 V

Refer to Autodata test specifications for settings as regards ignition, idle speed, emissions, valve clearance etc.

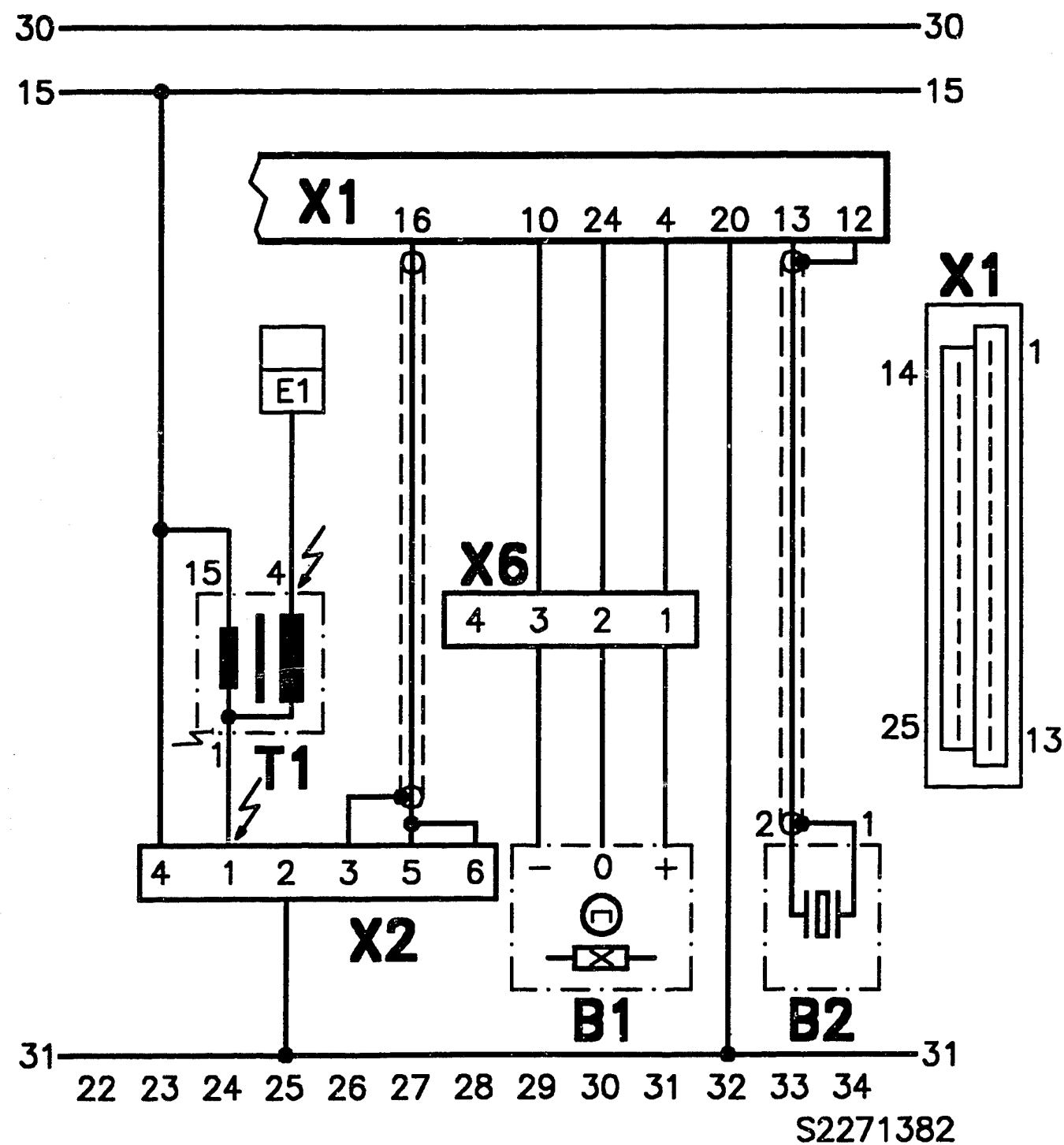
M18



ELECTRICAL TERMINAL DIAGRAM

H1 = Fault lamp, self-diagnosis
 S1 = Throttle-valve switch
 X1 = EI-K control-unit plug

X3 = LH 2.2 Jetronic control-unit plug
 X4 = LH 2.4 Jetronic control-unit plug
 X5 = Diagnosis connection

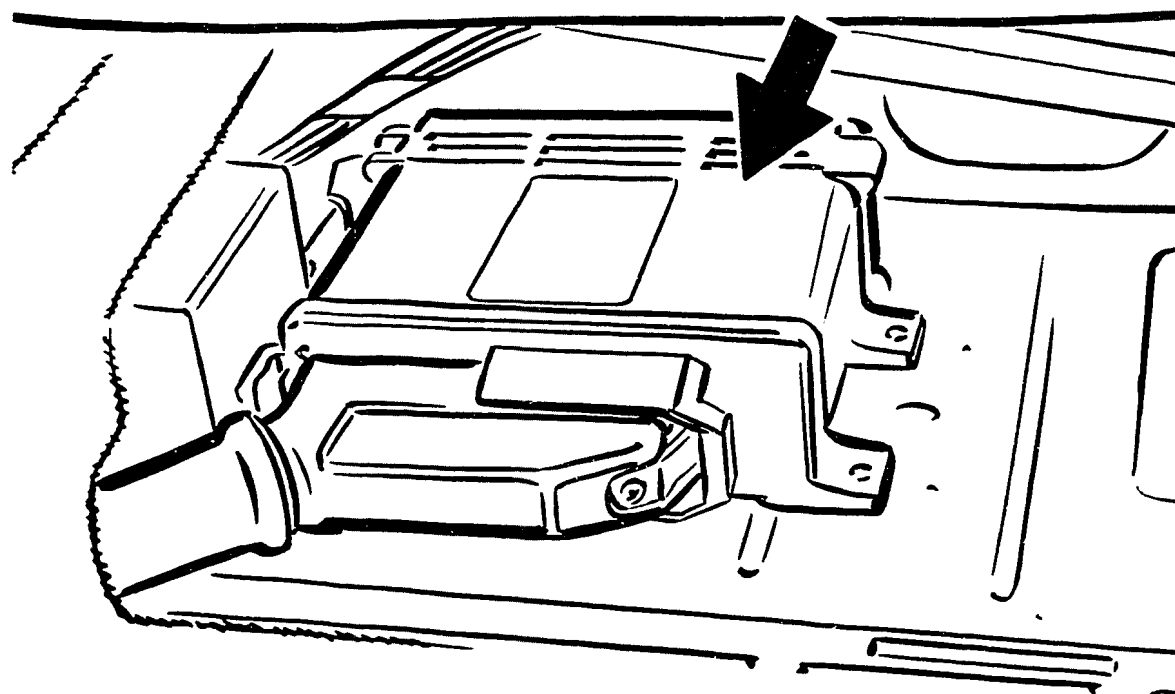


ELECTRICAL TERMINAL DIAGRAM (CONTINUED)

H.T. arrows: Caution 400 V...25 kV

B1 = Magnetic pulse generator
 B2 = Knock sensor
 E1 = to ignition distributor
 T1 = Ignition coil

X1 = EI-K control-unit plug
 X2 = Trigger-box plug
 X6 = Magnetic-pulse-generator plug connection

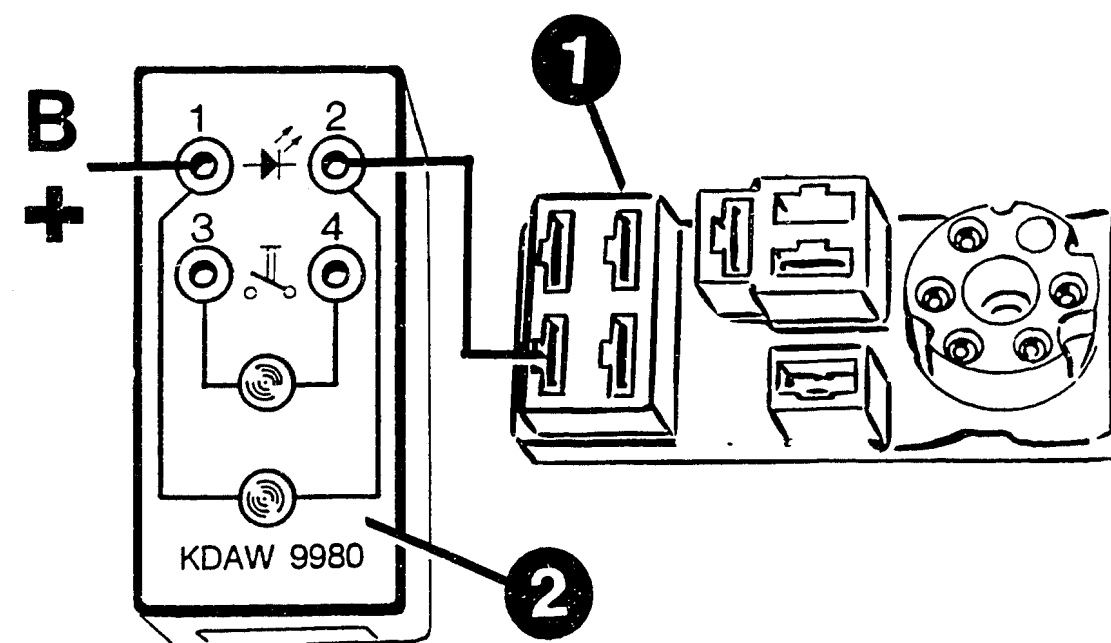


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Arrow = EI-K control unit

INSTALLATION POSITION OF COMPONENTS

EI-K control unit is located beneath driver's seat on left.



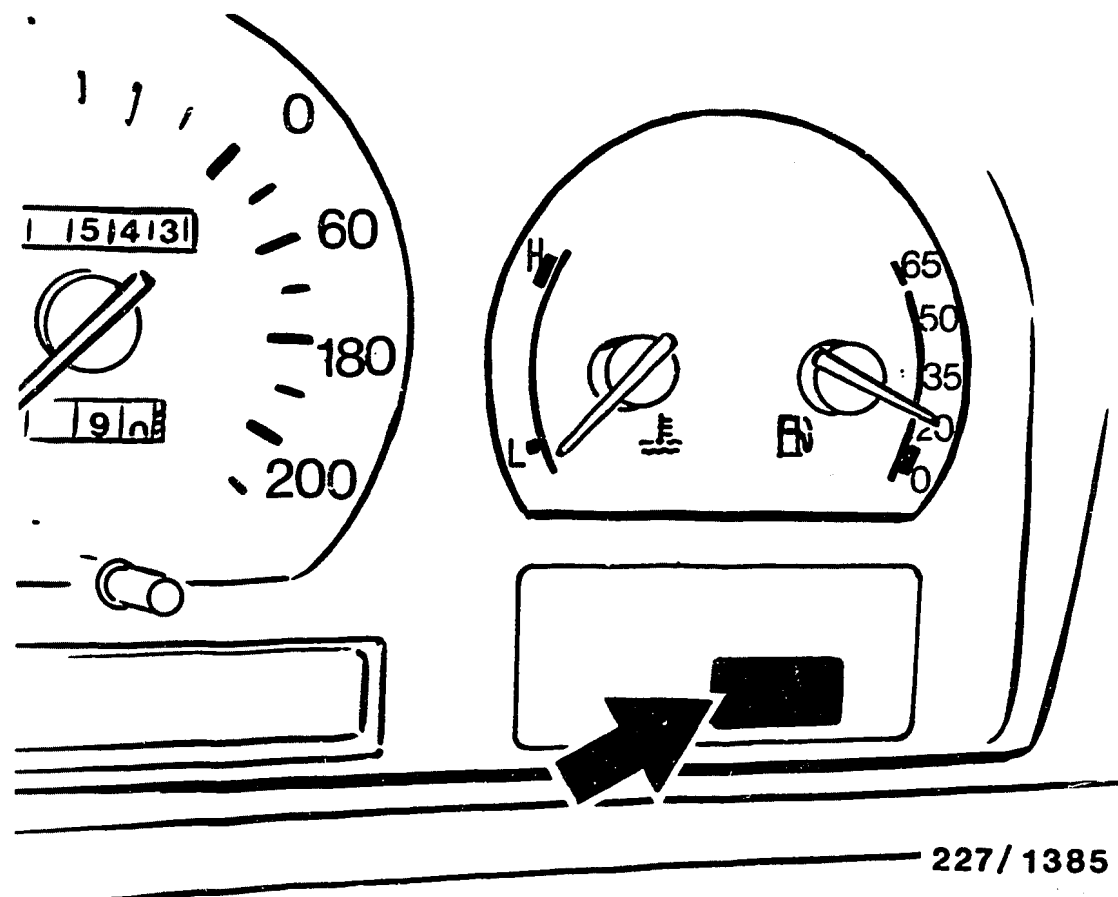
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Saab 9000i 16

1 = Diagnosis connection

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

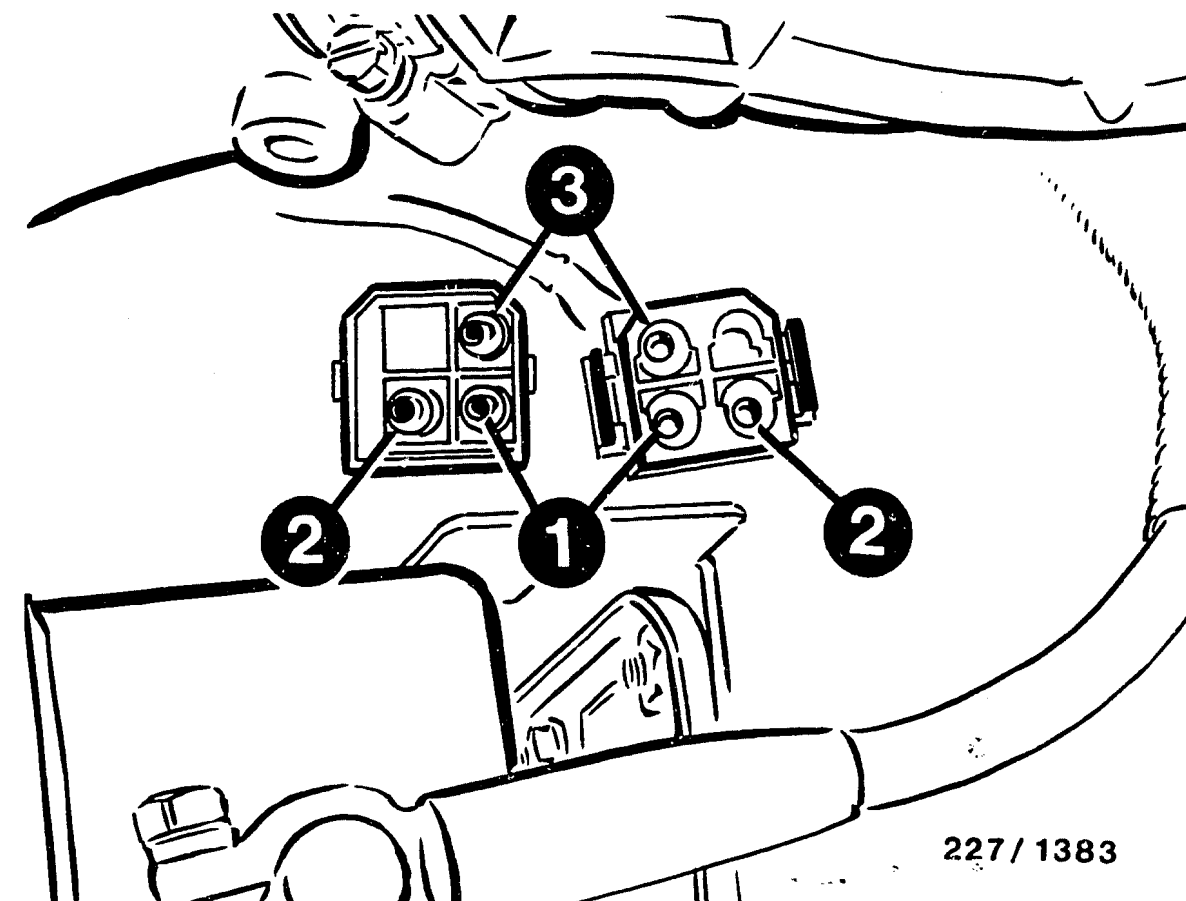
The diagnosis connection is located behind the engine bulkhead on the left-hand wheel box.



Saab 9000i 16

Arrow = Fault lamp in instrument panel
(CHECK ENGINE)

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

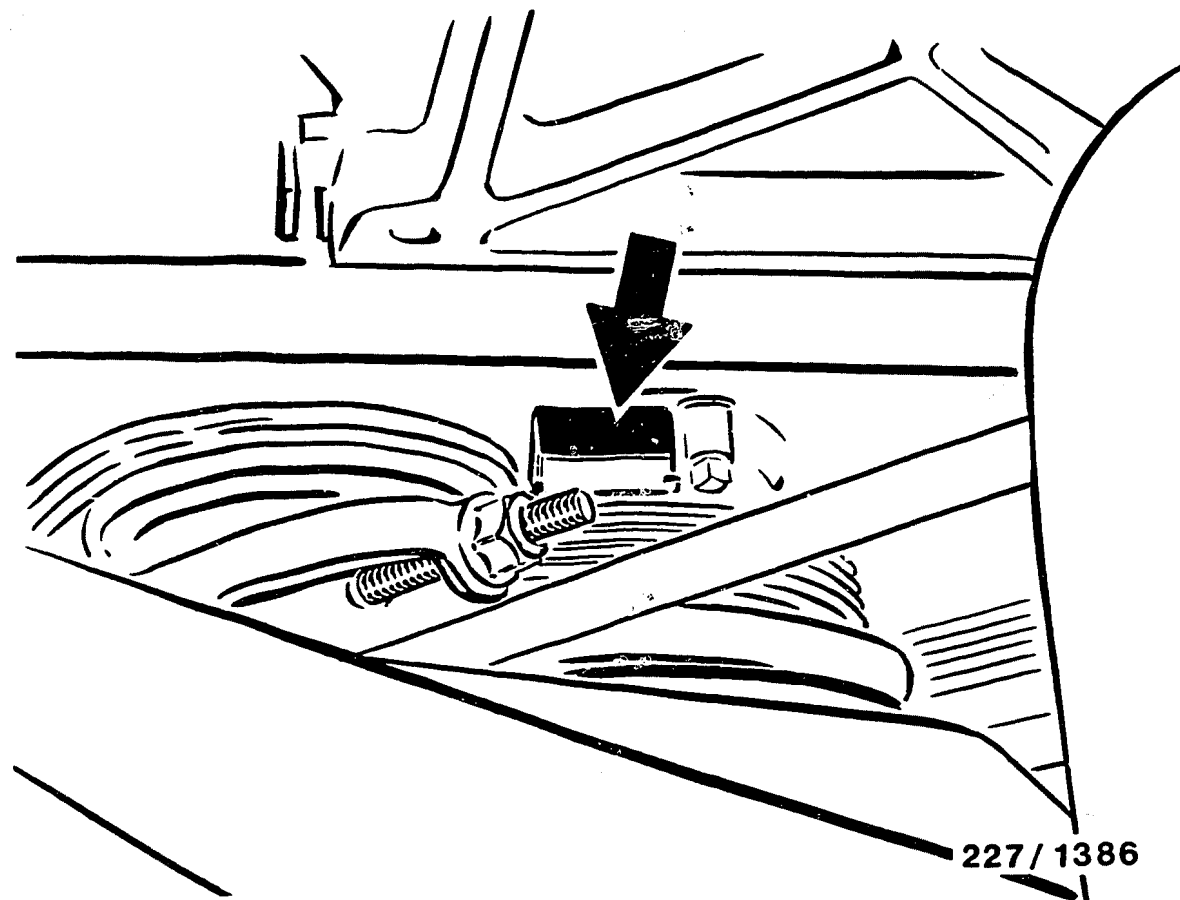


Saab 9000i 16

Arrow = Magnetic-pulse-generator plug connection

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The plug connection of the magnetic pulse generator is located between air-flow sensor and battery.



Saab 9000i 16
Arrow = Magnetic pulse generator (Hall)

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The magnetic pulse generator is fitted between engine and crankshaft pulley.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Removal and installation instructions for magnetic pulse generator:

REMOVAL:

- Remove V-belt and drive belt.
- Unscrew fastening screw of V-belt pulley.
- Detach V-belt pulley by hand.
- Unscrew magnetic pulse generator.

INSTALLATION:

- Apply Loctite to screws of magnetic pulse generator.
- Screw first screw into round hole in magnetic pulse generator; then secure opposite side.
- Attach V-belt pulley (pay attention to vee) and tighten to 190 Nm.
- Fit V-belt and drive belt.

Trouble-shooting instructions : VOL-5007
BOSCH system : EI-K
Vehicle make : VOLVO
Basic microcard : KFZ-00..

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SPECIAL FEATURES

These brief instructions, valid at the time of publication, apply to the following VOLVO model:

VOLVO 480 Turbo 04.86→
VOLVO 440 Turbo 09.88→

with 1.8 l/ 4-cyl. engine B 18 FT

* EI-K control unit 0 227 400 125,..156

(on account of modified camshaft, EI-K control units are n o t interchangeable)

* Ignition coil with trigger box 0 221 600 056
(with current limitation)

* Ignition coil 1 227 020 026

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.

For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!

High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on.
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

Cause (component fault)										
*	*	*	*	*	*	*	*	*	*	Self-diagnosis
*			*							H.T. end
*										Firing sequence
*			*							Ignition coil
*										Voltage, trigger box
*										Primary circuit
*										Voltage, EI-K control unit
*										Insulation, engine-speed and reference-mark sensor
*										Internal resistance, engine-speed and reference-mark sensor
*										Voltage, engine-speed and reference-mark sensor
*										EI-K control-unit function
*										Contact resistance
*										Engine-speed signal
*										Primary signal
	*	*		*						Throttle-valve switch (idle)
								*		Full-load signal

TROUBLE-SHOOTING CHART (CONTINUED)

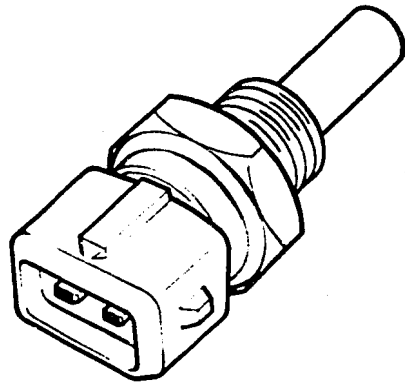
Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on (dieseling).
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

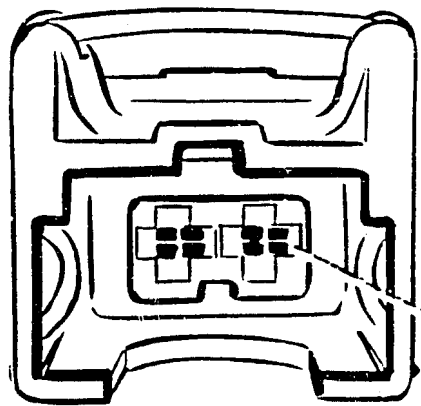
Cause (component fault)										
			*							Charge-air-pressure freq. valve
			*							Voltage, trigger box (engine idling)
			*							Voltage, ignition coil (engine idling)

SELF-DIAGNOSIS TEST TABLE

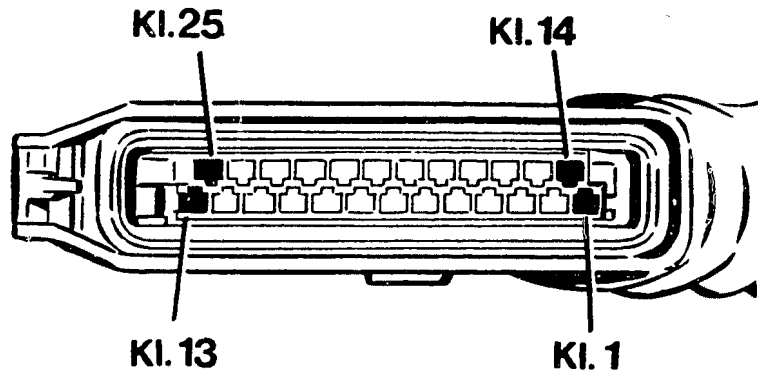
Fault indication Flashing code	Testing of component/function Test instructions/conditions	Termi- nals	Set values
2	<p>TEMPERATURE SENSOR (COOLANT)</p> <p>Detach temperature-sensor plug. Resistance, temperature sensor. See top picture.</p> <p>Visual inspection, temperature-sensor plug (oxidation, corrosion, contact spring damaged). See center picture.</p> <p>Detach EI-K control-unit plug. See bottom picture. Test temperature-sensor plug and EI-K control-unit plug for open circuit, short to ground/short to positive.</p>	<p>—</p> <p>2 2</p>	<p>+ 20°C= 2.1–2.9 k Ω</p> <p>+ 30°C= 1.4–2.0 k Ω</p> <p>+ 80°C= 280–370 Ω</p> <p>+ 90°C= 210–280 Ω</p> <p>+100°C= 160–210 Ω</p>
3	<p>THROTTLE-VALVE SWITCH (IDLE) WITH POTENTIOMETER (LOAD PICK-OFF VOLTAGE TOO SMALL/LARGE)</p> <p>Visual inspection, throttle valve (dirt).</p> <p>Check throttle-valve basic setting.</p> <p>Throttle-valve-switch basic setting. Resistance, throttle-valve switch. Throttle valve in idle position. Open throttle valve approx. 1°.</p> <p>Continued on next picture page</p>	<p>4 6</p>	<p>approx. 0 Ω</p> <p>infinity Ω</p>



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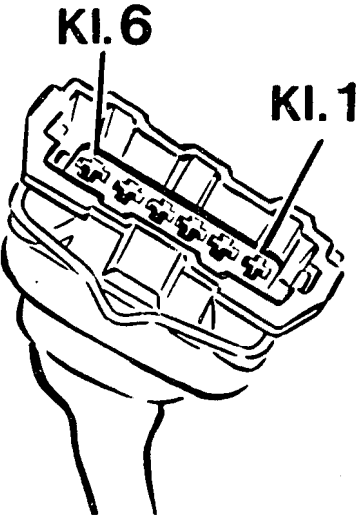
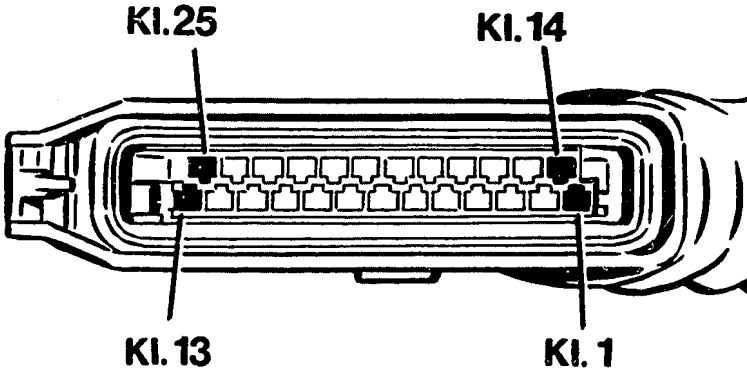
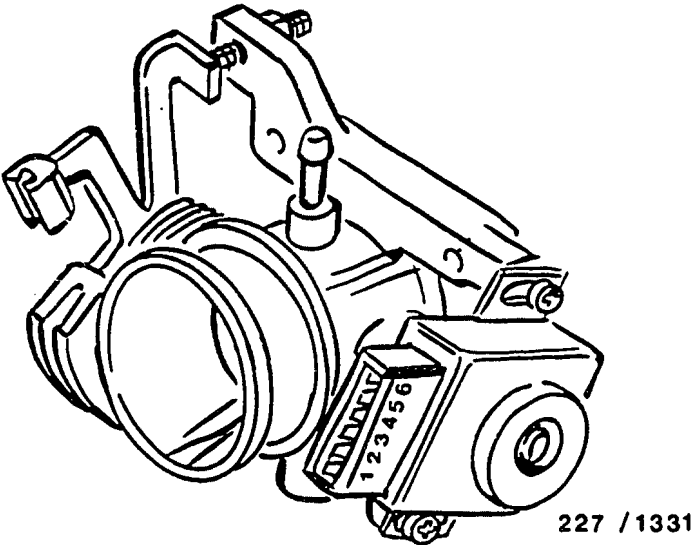
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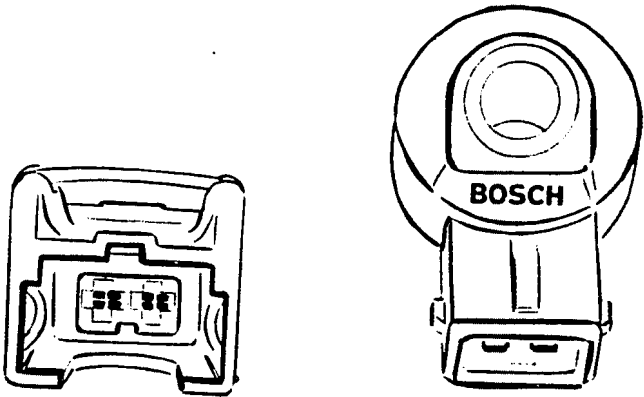
SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function Test instructions/conditions	Termi- nals	Set values
3	THROTTLE-VALVE SWITCH (IDLE) WITH POTENTIOMETER (LOAD PICK-OFF VOLTAGE TOO SMALL/LARGE) (continued)		
	Resistance, throttle-valve potentiometer. See top picture.	1 2 2 3	3...5 k Ω 350...600 Ω
	Resistance, EI-K control-unit plug and throttle-valve-switch plug. See center and bottom pictures.	22 1 21 2 25 3	approx. 0 Ω approx. 0 Ω approx. 0 Ω
	Check leads of throttle-valve-switch plug for short to ground and short to positive.	1 3	
	Attach EI-K control-unit plug. Attach throttle-valve-switch plug, push back rubber seal.		
	Voltage, throttle-valve-switch plug (idle setting). Ignition ON.	1 2 (+) (-)	3.5...4.5 V
		3 2 (+) (-)	0.3...0.6 V
	Completely open throttle valve.	3 2 (+) (-)	3.0...4.2 V

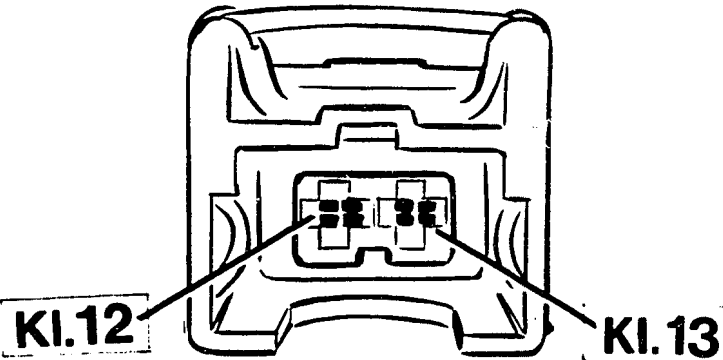


SELF-DIAGNOSIS TEST TABLE (CONTINUED)

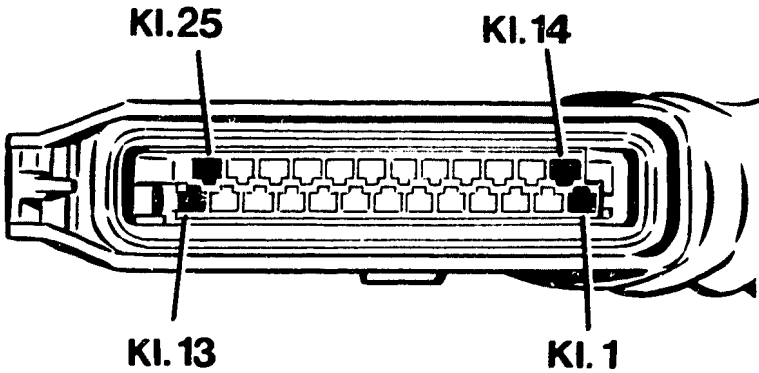
Fault indication Flashing code	Testing of component/function Test instructions/conditions	Termi- nals	Set values
4	<p>KNOCK SENSOR</p> <p>Visual inspection (check knock-sensor plug and socket for oxidation and corrosion). See top picture.</p> <p>Detach EI-K control-unit plug. Resistance, EI-K control-unit plug and knock-sensor plug. See center and bottom pictures.</p> <p>Check knock-sensor-plug lead for short to ground.</p> <p>Tightening torque.</p>	<p>12 12 13 13</p> <p>13</p>	<p>approx. 0 Ω approx. 0 Ω</p> <p>15...25 Nm</p>
5	<p>EI-K CONTROL UNIT</p> <p>Renew EI-K control unit.</p>		
6	<p>LOAD SIGNAL</p> <p>Connect resistance decade 120 Ω to throttle-valve-switch plug.</p> <p>Detach pressure hose, EI-K control unit. Connect Mityvac pump to EI-K control unit and build up pressure of approx. 300 mbar. Run engine for more than 10 seconds with equal to/greater than 4000 min⁻¹ and then allow engine to idle.</p> <p>Continued on next picture page.</p>	<p>1 3</p>	



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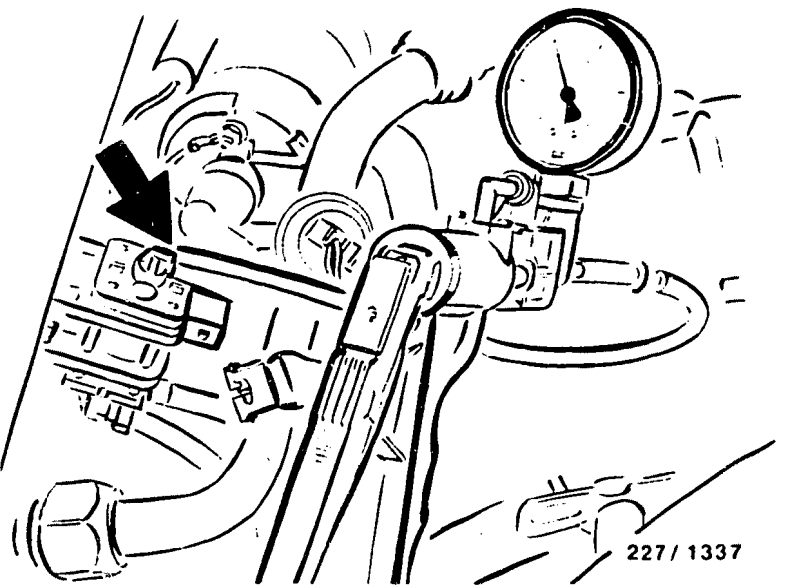
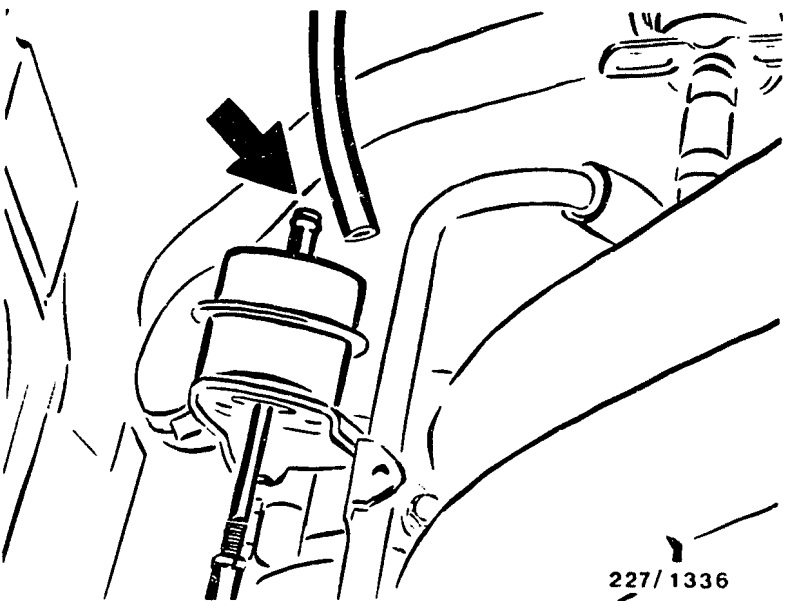
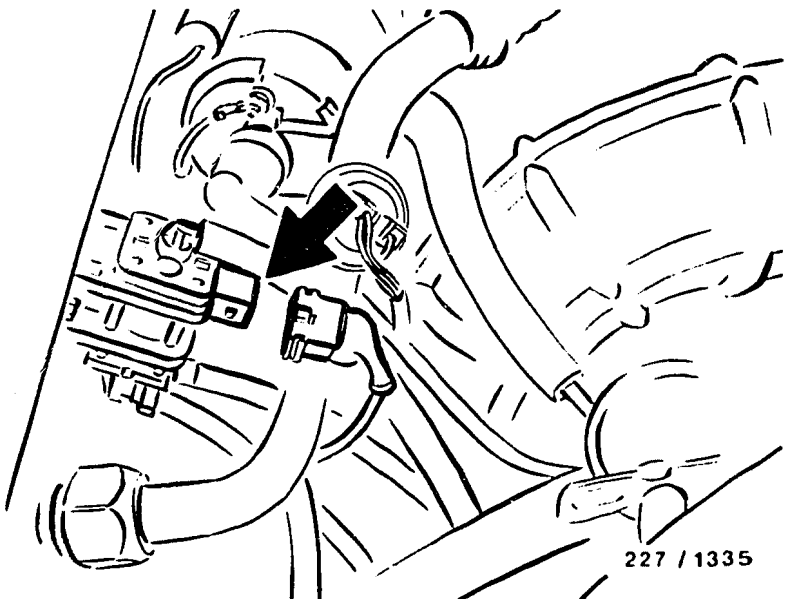
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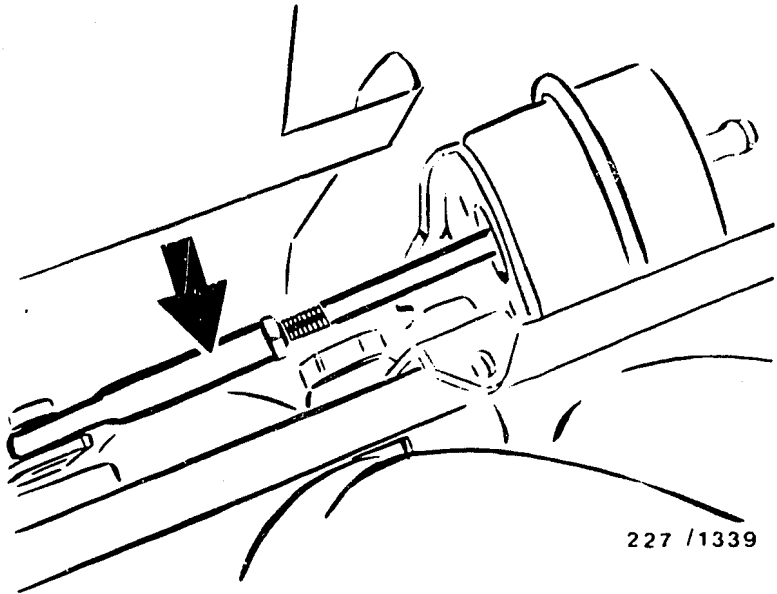
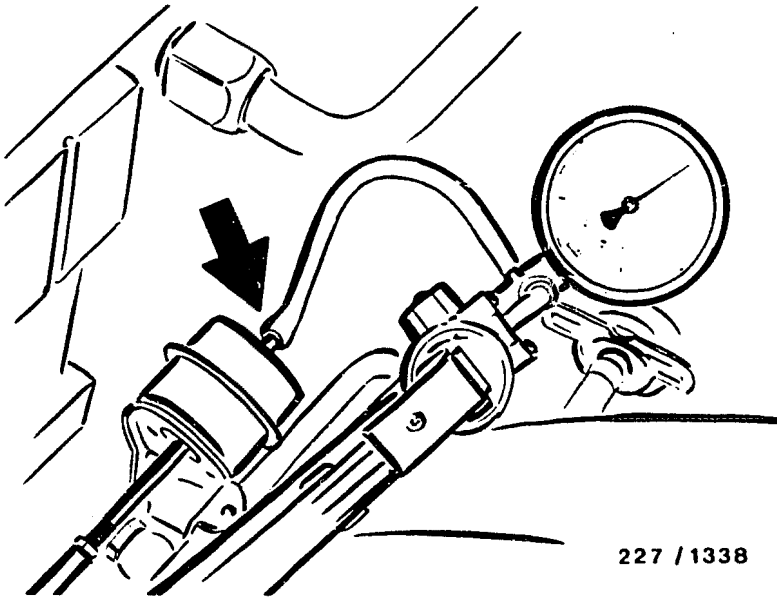
SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function Test instructions/conditions	Termi- nals	Set values
6	<p>LOAD SIGNAL (continued)</p> <p>Read out flashing code. If flashing code 6 is no longer indicated, check for leaks in pressure hose, EI-K control unit to intake manifold.</p> <p>Detach resistance decade from throttle-valve-switch plug. Attach pressure hose, EI-K control unit.</p> <p>Detach plug, charge-air-pressure frequency valve. See top picture, arrow. Perform test drive. In doing so run engine for more than 10 seconds with equal to/greater than 400 min⁻¹ and with accelerator pedal fully depressed. Allow engine to idle.</p> <p>Read out flashing code. If flashing code 6 is no longer indicated, check lead, EI-K control-unit plug for short to ground.</p> <p>Check hoses, charge-air-pressure control for leaks.</p> <p>Detach hose, diaphragm control valve. See center picture, arrow. Detach hose, charge-air-pressure frequency valve.</p> <p>Connect Mityvac pump to frequency valve. See bottom picture, arrow.</p> <p>Continued on next picture page</p>	<p>1 3</p> <p>16</p>	



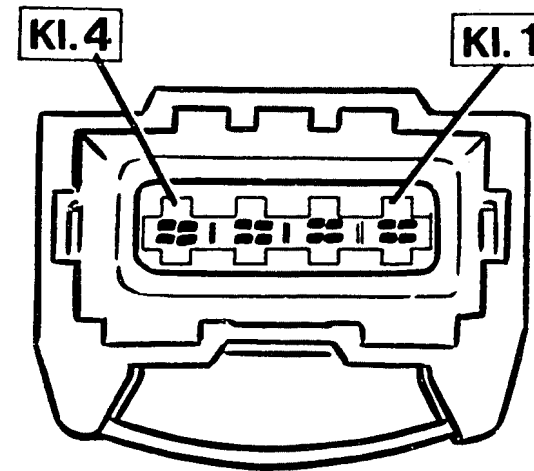
SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function Test instructions/conditions	Termi- nals	Set values
6	<p>LOAD SIGNAL (continued)</p> <p>Actuate Mityvac pump (pressure side).</p> <p>Connect Mityvac pump to diaphragm control valve. See top picture, arrow.</p> <p>Build up pressure of 280...300 mbar with Mityvac pump.</p> <p>Note: Renew EI-K control unit if pushrod has moved.</p>		<p>No pressure indication</p> <p>Pushrod, diaphragm control valve must move (bottom picture, arrow).</p>

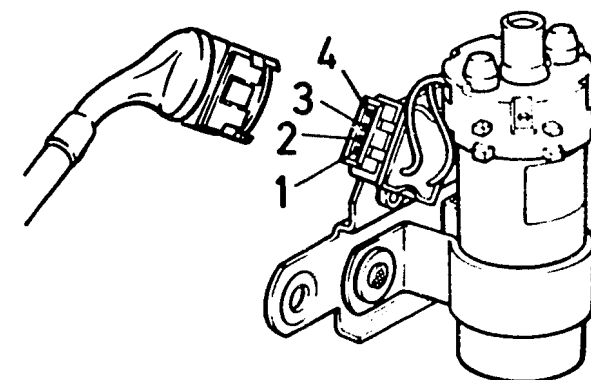


RAPID DIAGNOSIS CHART

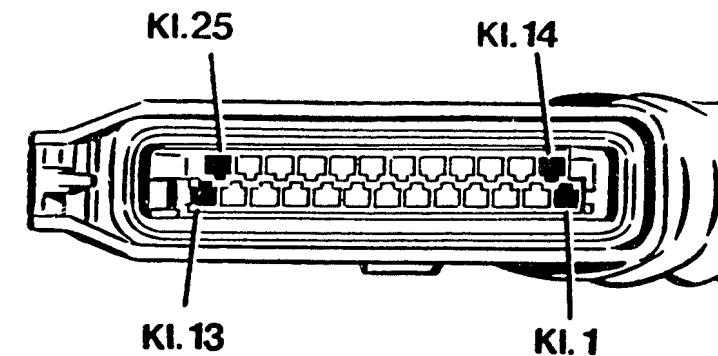
Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
1	H.T. END Check function (e.g. open circuit, shunt) of for example spark plugs, ignition harness, distributor cap. Assess for example by way of ignition oscillogram, resistance measurement, visual inspection.	—	—
2	IGNITION COIL Visual inspection: plug present, sealing compound oozed out? Resistance, primary Resistance, secondary	1 15 1 4	0.6...1.0 Ω 6.4...11.1 k Ω
3	VOLTAGE, TRIGGER BOX Detach trigger-box plug. See top picture. Ignition ON. Voltage, trigger-box plug.	3 2 (+) (-)	Battery voltage
4	PRIMARY CIRCUIT Trigger-box plug detached. Ignition OFF. Resistance, trigger-box plug and ignition coil. See center picture.	3 15	approx. 0 Ω (continuity)
5	VOLTAGE, EI-K CONTROL UNIT Detach EI-K control-unit plug. Ignition ON. Voltage, EI-K control-unit plug. See bottom picture.	6 20 (+) (-) 5 20 (+) (-)	Battery voltage Battery voltage



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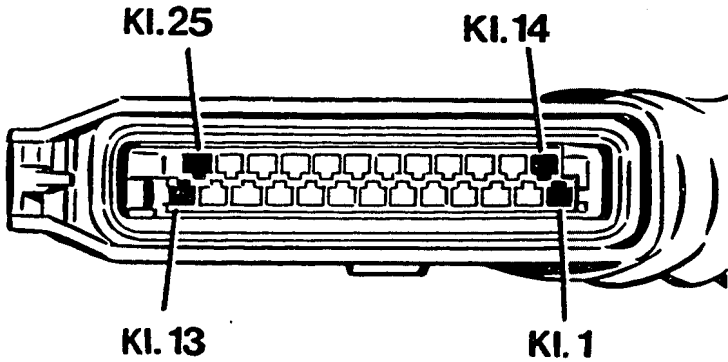
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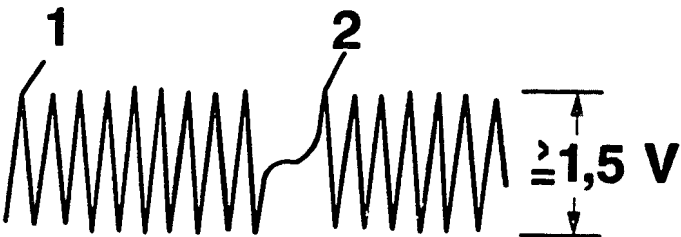
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RAPID DIAGNOSIS CHART (CONTINUED)

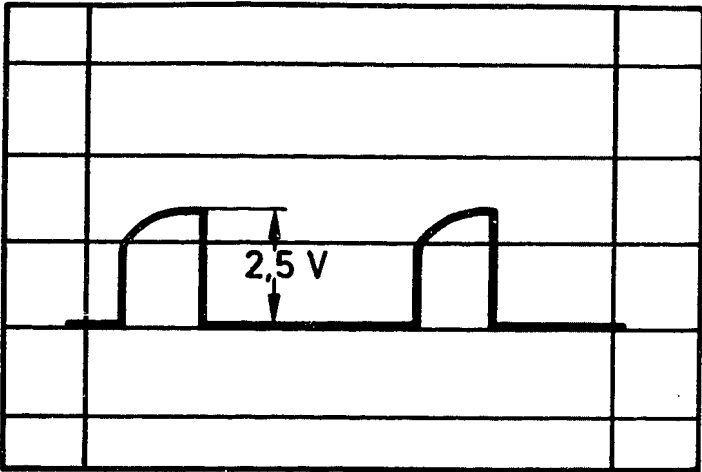
Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
6	INSULATION, ENGINE-SPEED AND REFERENCE-MARK SENSOR EI-K control-unit plug detached. Resistance, EI-K control-unit plug. See top picture.	23 11	infinity Ω
7	INTERNAL RESISTANCE, ENGINE-SPEED AND REFERENCE-MARK SENSOR Resistance, EI-K control-unit plug.	23 10	160...280 Ω
8	VOLTAGE, ENGINE-SPEED AND REFERENCE-MARK SENSOR Oscilloscope "Special" to EI-K control-unit plug. Start engine.	23 10 (+) (-)	equal to/greater than 1.5 V (center picture)
9	EI-K CONTROL-UNIT FUNCTION Trigger-box and EI-K control-unit plug attached. Push back rubber sleeve of trigger-box plug. Oscilloscope "Special" to trigger-box plug and vehicle ground. Start engine. * Note: The minimum voltage is important and not the profile (edges may be smooth).	4 B - (+) (-)	* Rectangular pulse equal to/greater than 2.5 V (bottom picture)
10	CONTACT RESISTANCE (PRIMARY SIDE) Detach negative and positive lead of battery. Detach trigger-box plug. Ignition ON. Resistance between battery terminal and trigger-box plug.	B+ 3 B- 2	max. 0.3 Ω



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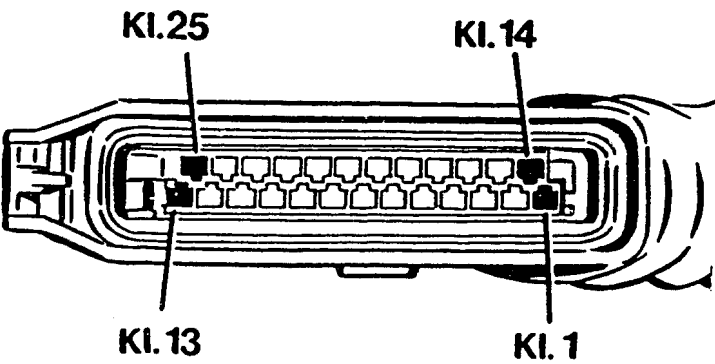
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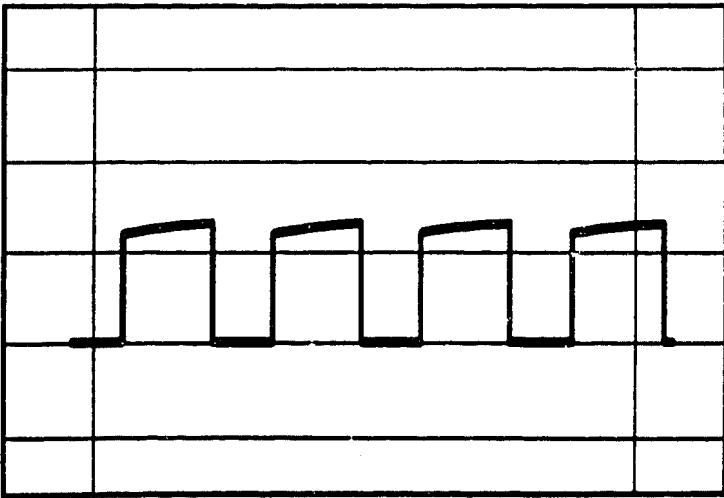
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RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
12	ENGINE-SPEED SIGNAL Connect negative and positive lead to battery. Attach trigger-box plug. Detach LH-Jetronic control-unit plug. See top picture. Oscilloscope "Special" to LH-Jetronic control-unit plug and vehicle ground. Start engine.	1 B- (+) (-)	Rectangular pulse (bottom picture)
13	PRIMARY SIGNAL Attach LH-Jetronic control-unit plug. Oscilloscope/engine-speed tester to ignition coil. Start engine.	15 1 (+) (-)	Primary voltage/ engine-speed indication (magnitude irrelev.)
14	THROTTLE-VALVE SWITCH (IDLE) Throttle-valve visual inspection (throttle housing, dirt). Check throttle-valve basic setting. Throttle-valve-switch basic setting. Detach LH-Jetronic control-unit plug. Detach EI-K control-unit plug. Resistance, EI-K control-unit plug. Throttle valve in idle setting. Open throttle valve approx. 1°.	7 14	approx. 0 Ω infinity Ω
15	FULL-LOAD SIGNAL Attach LH-Jetronic control-unit plug with handle cover detached. Voltage, LH-Jetronic control-unit plug and vehicle ground. Continued on next picture page	12 B- (+) (-)	



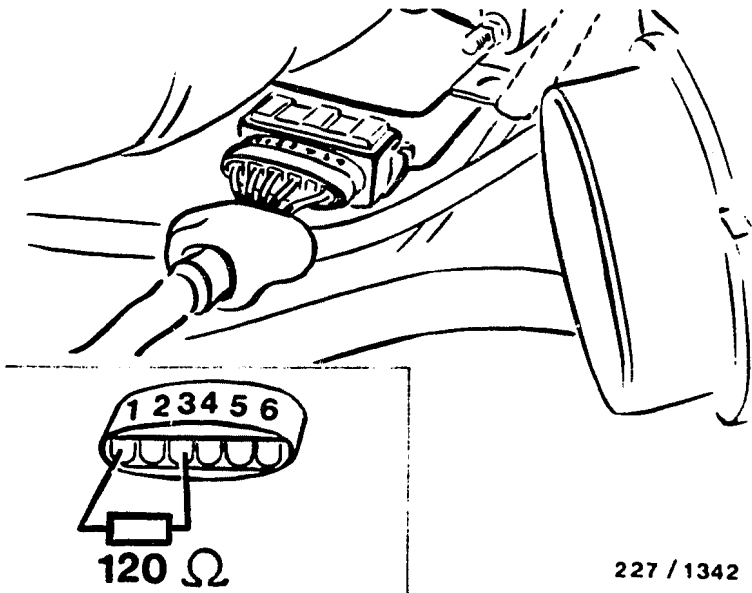
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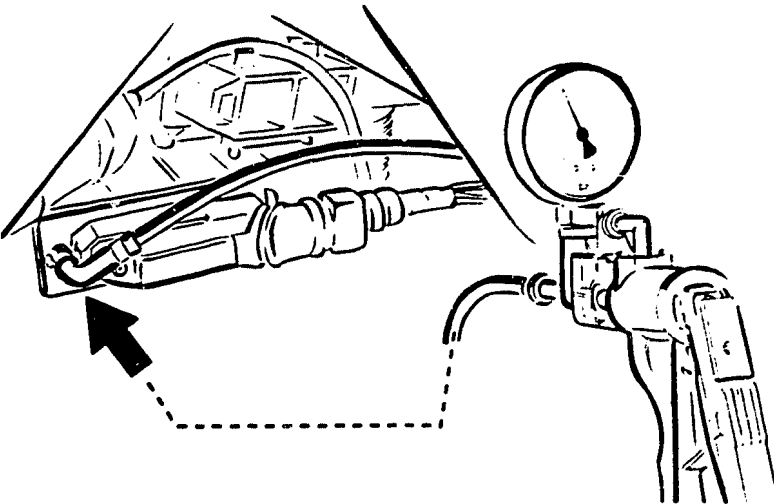
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RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
16	<p>FULL-LOAD SIGNAL (continued) Push back rubber sleeve of throttle-valve-switch plug and connect up resistance decade (120 Ω). See top picture. Detach pressure hose, EI-K control unit and connect Mityvac pump to EI-K control unit. Build up pressure of 200 mbar. See bottom picture. Run engine at 2500...3000 min⁻¹.</p>	1 3	0.2...1.0 V
17	<p>CHARGE-AIR-PRESSURE FREQUENCY VALVE Connect pressure gauge/Mityvac pump (pressure) to EI-K control unit. Perform test drive (road/dynamometer). In doing so, run engine at equal to/greater than 4500 min⁻¹ with accelerator pedal fully depressed. Read off charge-air pressure.</p>		equal to/greater than 450 mbar
18	<p>VOLTAGE, TRIGGER BOX Push back rubber sleeve of trigger-box plug. Voltage, trigger-box plug. Engine idling.</p>	3 (+) 2 (-)	12-14 V max. 1 V below U _B
19	<p>VOLTAGE, IGNITION COIL Voltage at ignition coil and battery. Engine idling.</p>	15 B- (+) (-)	equal to/greater than 10 V



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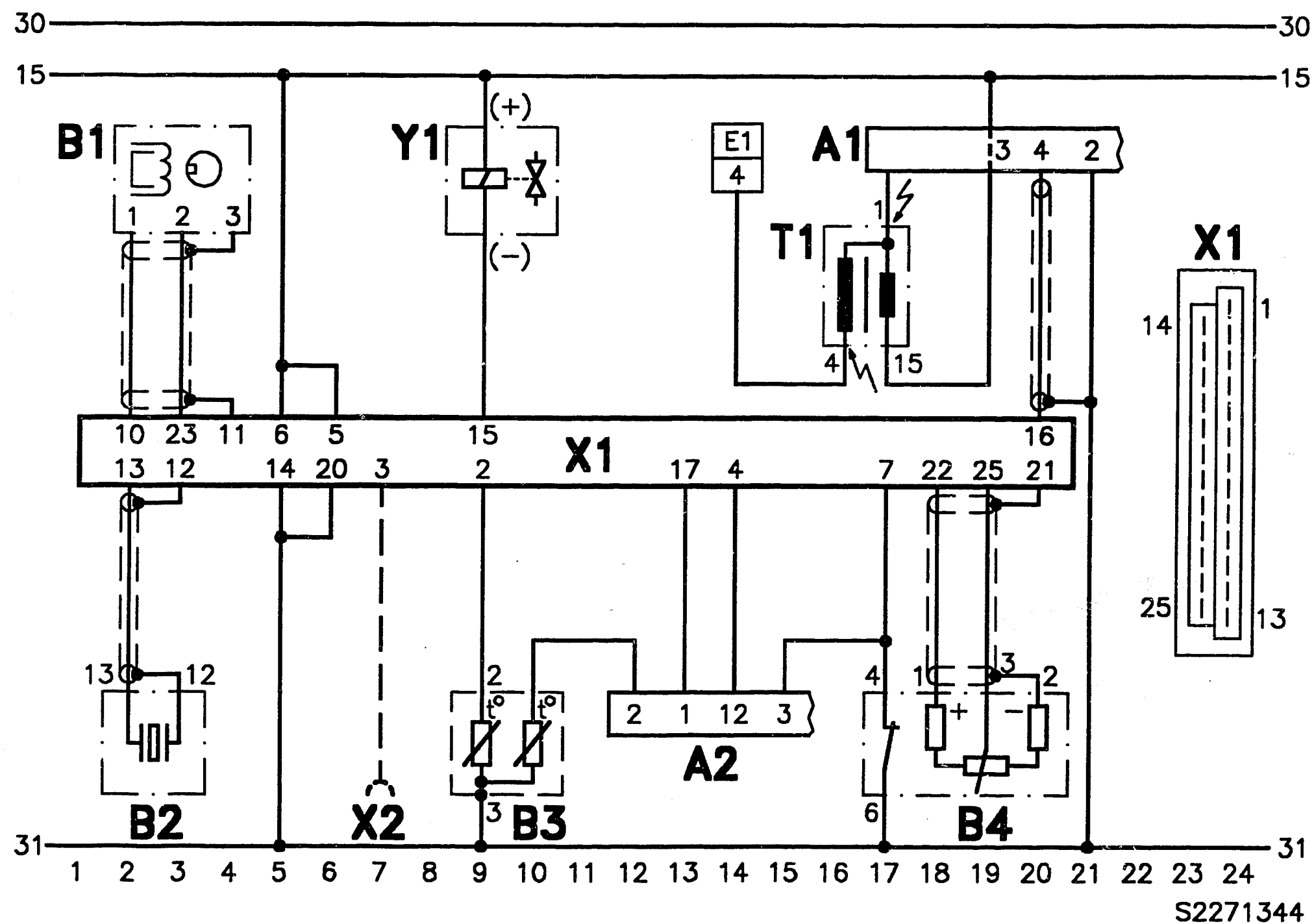
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TEST SPECIFICATIONS

Temperature sensor (coolant)	+20° C 2.1...2.9 k Ω +30° C 1.4...2.0 k Ω +80° C 280...370 Ω +90° C 210...280 Ω +100° C 160...210 Ω
Throttle-valve switch (idle) Throttle valve in idle setting term. 4 and 6 Open throttle valve approx. 1°	approx. 0 Ω infinity Ω
Throttle-valve switch (idle) with potentiometer Idle setting term. 1 and 2 term. 2 and 3 term. 1 and 2 term. 3 and 2 Fully open throttle valve term. 3 and 2	3...5 k Ω 350...600 Ω 3.5...4.5 V 0.3...0.6 V 3.0...4.2 V
Knock-sensor tightening torque	15...25 Nm
Diaphragm control valve, build up 280...300 mbar	pushrod moves
Ignition coil, primary Ignition coil, secondary	0.6...1.0 Ω 6.4...11.1 k Ω
Voltage, trigger box with ignition ON	battery voltage
Primary circuit	approx. 0 Ω (continuity)
Voltage, EI-K control unit with ignition ON	battery voltage
Insulation, engine-speed and reference-mark sensor	infinity Ω
Internal resistance, engine- speed and reference-mark sensor	160...280 Ω

TEST SPECIFICATIONS (CONTINUED)

Voltage, engine-speed and reference-mark sensor at cranking speed	equal to/greater than 1.5 V
EI-K control-unit function at cranking speed	Rectangular pulse equal to/gr. than 2.5 V
Contact resistance Supply leads Trigger box	max. 0.3 Ω
Engine-speed signal at cranking speed	Rectangular pulse
Primary signal at cranking speed	Primary voltage/ engine-speed indication
Full-load signal at engine speed 2500... 3000 min ⁻¹	0.2...1.0 V
Charge-air-pressure frequency valve Test drive at 4500 min ⁻¹ with accel. pedal fully depressed	Charge-air pressure equal to/gr. than 450 mbar
Voltage, trigger box with engine idling	12...14 V max. 1 V below U _B
Voltage, ignition coil with engine idling	equal to/gr. than 10 V
Refer to SIS Jetronic Microcard or Autodata test specifi- cations for settings as regards idle speed, emissions, valve clearance etc.	



ELECTRICAL TERMINAL DIAGRAM

H.T. arrows: caution 400 V...25 kV

A1 = Trigger box

A2 = LH-Jetronic control unit

B1 = Engine-speed and reference-mark sensor

B3 = Temperature sensor (coolant)

B4 = Throttle-valve switch (idle)

E1 = to ignition distributor

T1 = Ignition coil

Y1 = Charge-air-pressure frequency valve

X1 = EI-K control-unit plug

X2 = Diagnosis connection (not present in vehicle, must be retrofitted)

INSTALLATION POSITION OF COMPONENTS

- * EI-K control unit is located in center console on right (pushed in)
- * LH-Jetronic control unit is located in passenger-side footwell, front right.
- * Relay/fuse box is located on left in engine compartment behind engine bulkhead.
- * Engine-speed and reference-mark sensor is located at clutch housing.
- * Temperature sensor (coolant) is located at cylinder head beneath throttle valve.
- * Throttle-valve switch (idle) is located at throttle-valve assembly.
- * Ignition coil with trigger box is located at engine bulkhead.
- * Knock sensor is located at cylinder head between cylinders 2 and 3 (behind idle actuator).
- * Charge-air-pressure frequency valve is located at engine bulkhead.

For production reasons:
continued on the following
coordinate.